Using DelphNav™

User's Manual

based on DelphMap™ software through version 2.10

June 2004

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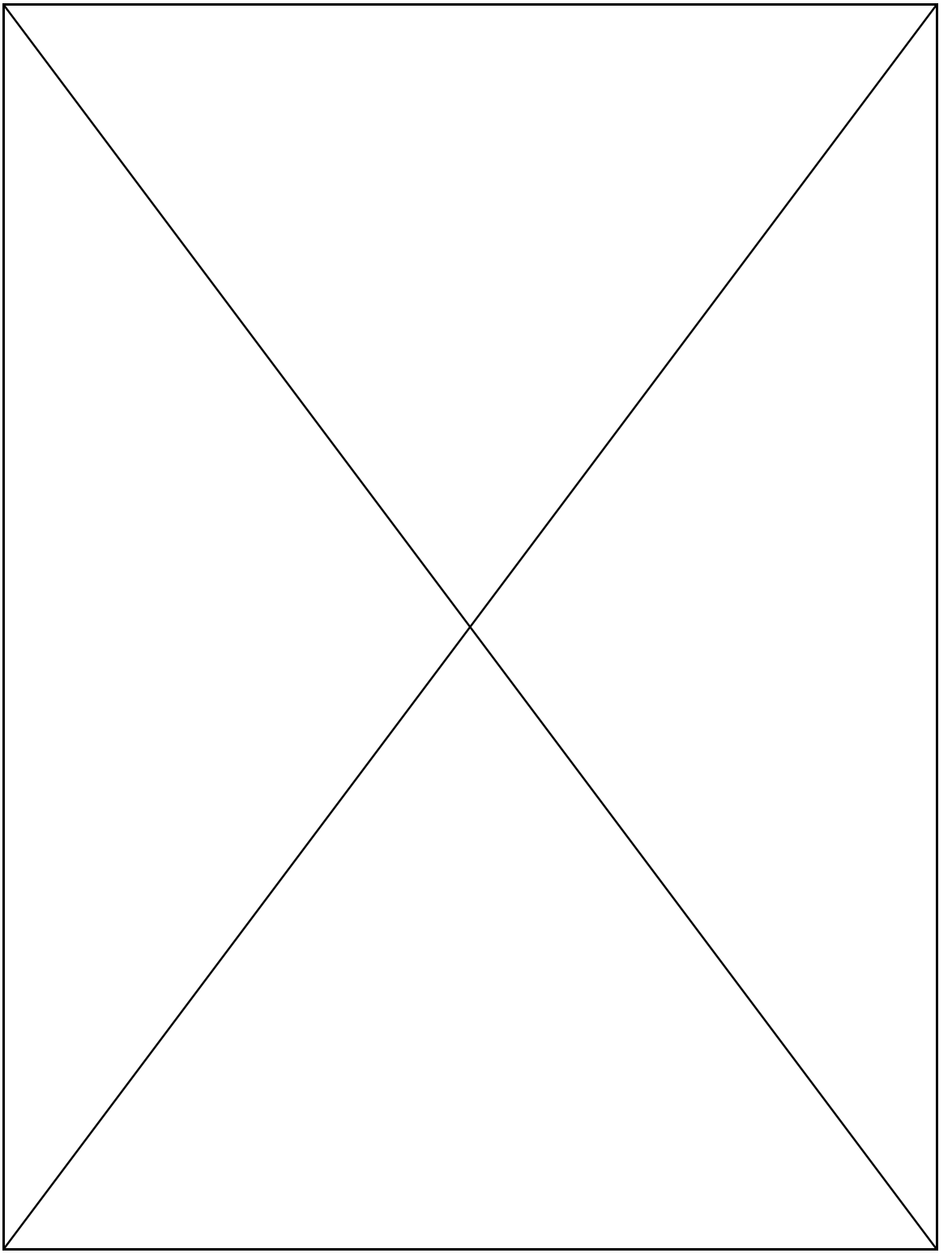

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CHAPTER 1

Using DelphNav™ (Survey Control Panel)

DelphNav Overview (Survey Control Panel)

DelphNav, embodied collectively in DelphMap™ as the Survey Control Panel, is a fully functional navigation package. It can receive and display up to two different sources of positioning information (for example, GPS, RTK, ATS, USBL, User-Defined) in addition to data from single-beam echo sounders, multibeam echo sounders, motion sensors, and auxiliary sensors (for example, gyros, depth sensors). Interfaces exist for Posidonia and TrackPoint II SBL/USBL-type systems.

Multiple window options are available for both primary and secondary navigation sources. These windows include a compass display, a helmsman display, text displays showing the status of incoming data strings, and a variety of alarm warnings. A Profile display for single-beam echo sounders supports dual frequency systems. X-Y graphs may be opened for other information types arriving in the system (for example, Pitch, Roll, Heave).

Data output is in the form of a user-defined ASCII string.

DelphNav supports full survey planning. Lines may be specified either graphically on the screen or through the insertion of individual waypoints. Parallel and perpendicular lines can easily be created relative to a single reference line. Lines may be selected for navigating with reference to the helmsman display, and line direction can be reversed such that the vessel's offset from the line (port/starboard) remains intuitive to the helmsman.

To run DelphNav

1. Start DelphMap (**`Delphmap.exe`**) and select the Survey Control Panel option from the **View** menu (**View** → **Survey Control Panel**; Figure 1).
2. Click **Project** → **New Project** or **Project** → **Open a Project**.
3. Select the folder you want to work in and the name of your project.

   Your DelphMap project file either opens if it already exists, or is created if new. You are now ready to set up your serial ports and survey lines.

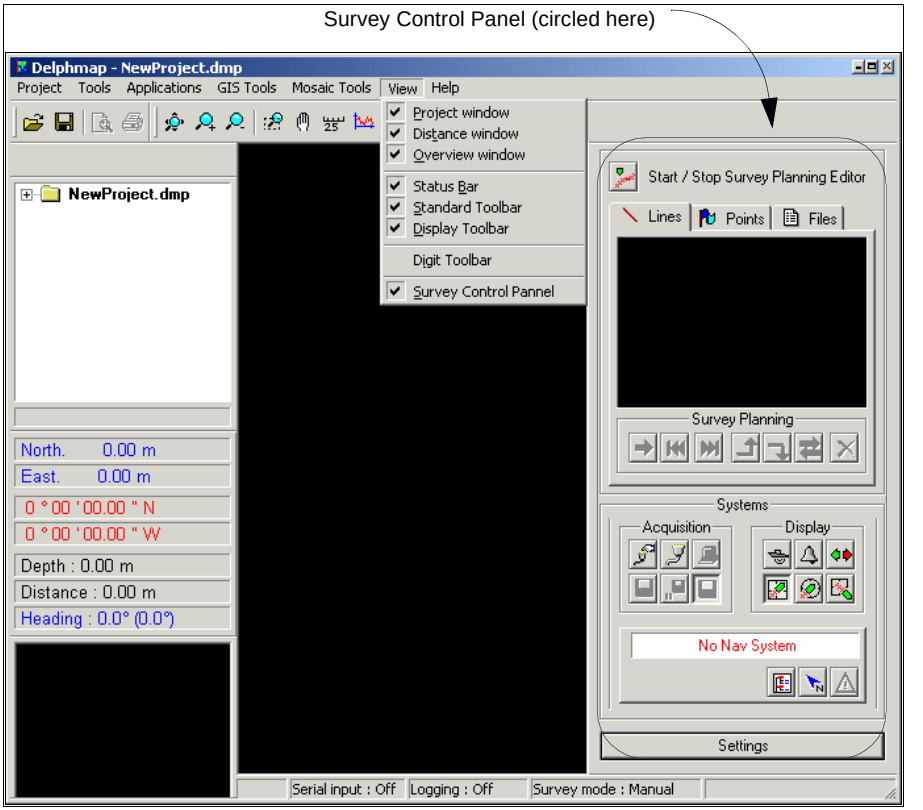


FIGURE 1. ***Initial DelphMap screen with multiple window views***

Setting Up Serial Ports

Serial ports are set up in DelphNav to track and log navigation data along with any other relevant ancillary sensor information (e.g., gyros, depth sensors, velocity sensors, etc.). Ports may also be allocated for the output of ASCII strings derived from incoming data.

Message templates can be assigned to ports to clarify which information strings hold higher precedence (e.g., in the case of two navigation strings) or to exclude fields within an information string (e.g., NOVTG to exclude speed information from a NMEA string).

To make basic serial port configurations in DelphNav

1. In the Survey Control Panel, click the Serial Port Setup icon (Figure 1; the icon shown here to the right).

The system displays the Serial Port Data Acquisition Settings dialog box (Figure 2), with COM1 as the initially displayed tab. Additional serial port choices appear as additional tab choices on the top row. Initially, red **X**s appear on the numbered serial port tabs, indicating no templates have yet been assigned to the ports.

A second row of tabs below the top row is associated with the selected System type. These tabs can be used to configure **Offsets**, **Geodesy**, or **Shape** parameters associated with the particular **System**. For systems other than Navigation, only the Offset tab is available, whereas for Output, a Settings tab is offered.

- **System** One of eight data types may be assigned to the selected serial port: **Navigation**, **Motion Sensor, Aux. Sensor, Single Beam**, **Scanning Sonar**, **User Defined Input**, **Output**, or **No template**.
- **Offsets** Allows offset distance of the sensor from a given reference point to be specified.
- **Geodesy** This relates to the Projection and Datum of the ***incoming*** navigation string. Unprojected geographic coordinates are the default input settings.

- **Shape** This relates to the object shape to be displayed in DelphMap for the particular navigation type. If two navigation strings are being received (e.g., vessel position and towfish position, or GPS position and Automatic Tracking System (ATS) position), a different shape can be allocated to each navigation type.
- **Settings / User Defined**Options specific to the Output and User Defined Input system types. User specifies the information types either sent or received over a serial port.

2. Select the COM port tab you wish to setup, click the **System** tab, and choose a system type. When you choose a system type, the icon for that system also appears on the serial port tab.

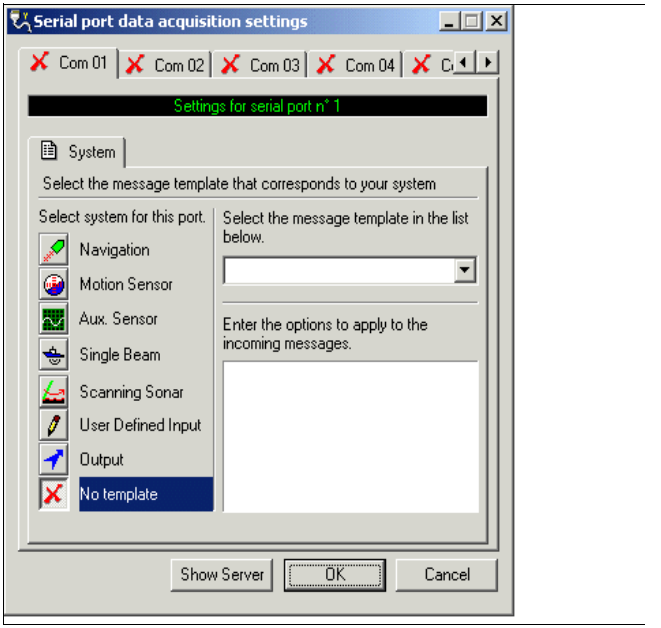


FIGURE 2. ***Serial port data acquisition settings dialog box***

3. Specify any additional options to be applied to the incoming string in the lower right-hand panel of the settings dialog box. For example, in the case of navigation from two different sources arriving on two different COM ports, designate which navigation system should be used as the Primary source by typing the command **MASTER** into the options text box. By default the lowest numbered serial port is assumed to contain the Primary navigation. This default can be overridden by typing **MASTER** in the higher numbered serial port's options text box. A button showing which COM port has been allocated as Master will be apparent on the Systems panel of the Survey Control Panel (Figure 3). This button may be toggled on the GUI to designate which navigation string (or COM port) is assigned as Master.

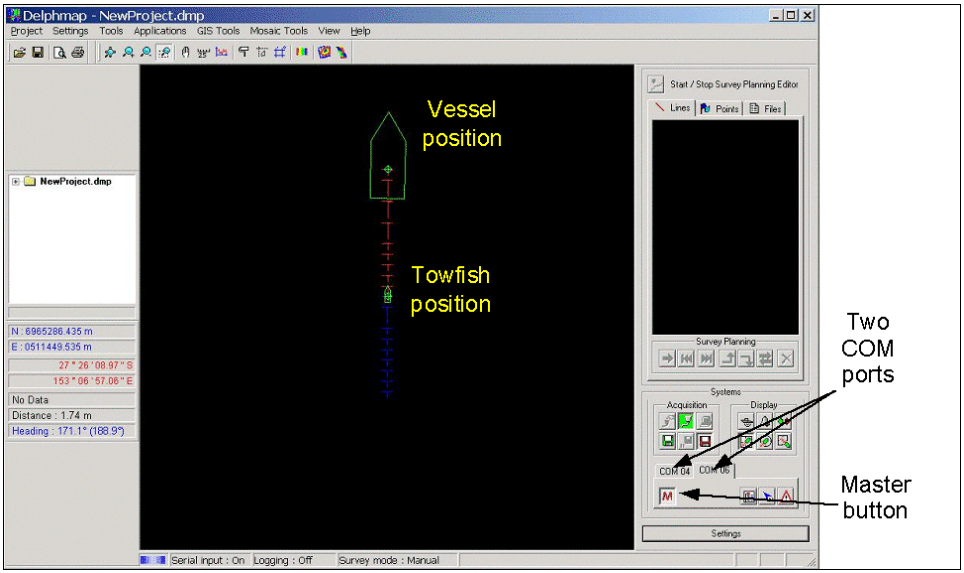


FIGURE 3. ***Vessel and towfish positions***

A master serial port has the following implications that influence data acquisition:

- Navigation stored within the XTF file created by DelphNav relates to the COM port defined as Master.

- Information output from DelphNav relates to the navigation string declared as Master.
- Data Display and Compass windows may be opened for either or both navigation input strings, with the Master string denoted by an “M” in the window menu bar (an “S” denotes the Secondary or Slave string).

A more complete description of available message templates and associated options is provided in the Message Templates and Options section of this manual.

4. Click **OK** in the Serial Port Data Acquisition Settings dialog box to register your serial port configuration choices.
5. In the Survey Control Panel, click the Serial Port Linkup button (shown here at the right).

The Serial Port Linkup icon turns green to show that it is active.

If no image or vector files have been loaded to define the survey area (Projection and Datum) DelphMap will prompt you for this information. The Shape objects selected for the navigation systems should appear in the DelphMap window shortly after the Serial Port Linkup button turns green.

Remember to activate and configure the relevant serial ports in the Serial Server program!

Serial Server

In order to keep the input and output requests from different applications from clashing when they access data from the same COM port, TEI has developed a Serial Port Server program, called **`SERIALSRV.EXE`**, to manage the process. Currently Delph Seismic, DelphSeismicPlus, and DelphNav use this program when reading data from a serial port in real time. The server program launches automatically upon selecting the Serial Port Linkup button.

Setting the Path to the Server

If you are recording navigation data with DelphNav for the first time, a dialog box will open upon selecting the Serial Port Linkup button that requests the location of the SERIALSRV.exe program. The location should be C:\{Windows Folder}\TEIdlls (e.g., C:\WINNT\TEIdlls). Once this path and file have been selected, the information is stored in a .INI file and the server will launch automatically during subsequent sessions.

Setting Up the Server

Once the Serial Server GUI has launched, COM ports may be set up to receive and view data (Figure 4).

To pick a port in the Serial Server Settings dialog box, click the appropriate number and then select the Setup button (note that the port must not be activated through the **On** option). This opens the standard Windows COMx Properties dialog box, enabling you to set the parameters for the port (baud rate, data bits, parity, stop bits, and flow control).

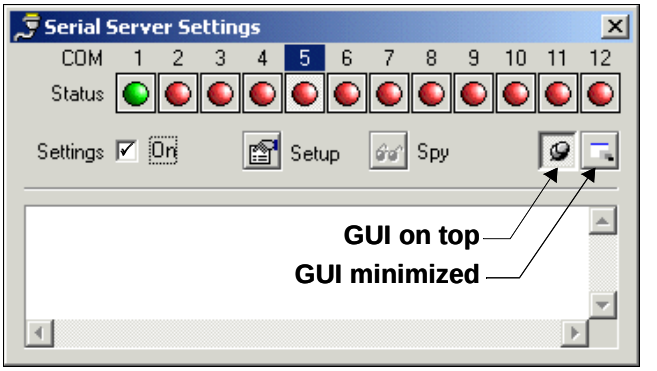


FIGURE 4. ***Serial Server Settings dialog for selecting COM ports***

An error message will be generated if the port is already busy through another application or if that port is not present on the particular system in use. Click **OK** when the parameters have been set correctly to return to the Serial Server dialog box.

After setting the parameters in the COM port properties dialog box and returning to the Serial Server dialog box, activate the port by selecting the **ON** box.

Proper reception of the incoming data string can be checked through the Spy button. Selection of the Spy button displays a sample of the relevant data in the dialog box window. If no data appear in this window, check the settings for the port and/or the activity of the sensor sending the data. Another possible fault source may be the serial cable.

Once these steps have been completed, the server has been setup and the COM port parameters will be remembered the next time you start DelphNav and attempt a Serial Port Linkup.

Note that the Serial Server program must be left running throughout the survey. The GUI associated with the program can either be minimized as an icon in the System Tray of the Windows Task Bar (the normal operating mode; Figure 5), or it can be specified as remaining on top of all other windows (GUI on top, Figure 4).

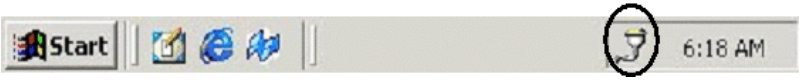


FIGURE 5. ***Serial Server GUI minimized as icon in system tray***

If the GUI is minimized in the System Tray (Figure 5), left-clicking the icon restores the serial server dialog box. Right-clicking the icon enables you to make changes to the serial setup without restoring the full dialog box.

Special Considerations for Working with Serial Server

As of the Fall 2000 release of TEI software, **`SERIALSRV.EXE`** is installed in a folder called **`C:\`***`{Windows Folder}`***`\TEIdlls`**, where *`{Windows Folder}`* is the main folder for the Microsoft Windows operating system (Windows 95, NT, 2000, etc.).

Once the path to the server has been chosen during startup and the serial server has been started, two **`INI`** files are created: **`SERIALSRV.INI`** and **`SERIALDLL.INI`**. These files can be found in the **`C:\`***`{Windows Folder}`*.

If a previous version of **`SERIALSRV.EXE`** has been started from some place other than C:\{Windows Folder}\TEIdlls, then one of two error messages is likely to occur:

"SERIALDLL.DLL was previously loaded from an unexpected folder."

or

"Server Launch FAIL: Launch it manually."

Other Error Messages

If your computer system finds certain older copies of some TEI DLLs, other error messages can result. For example, you might see the message, **`Missing Entry Points in Dynamic Link Library`**. In general, the solution to all these problems is as follows:

1. Shut down Serial Server if it is running: Click the serial server icon in the system tray next to the system clock, and then click the **X** in the top right corner of the Serial Server Settings box to close it.
2. Use Explorer to find and delete the two **INI** files **SERIALSRV.INI** and **SERIALDLL.INI**.
3. Check that the only copies of the following files are those that are in the **C:***{Windows Folder}***\TEIdlls** folder:
   - **SERIALSRV.EXE**
   - **SERIALDLL.DLL**
   - **MPX_LLNE.DLL**
   - **TEIGUIEXT.DLL**
   - **TEIMAP.DLL**
   - **TIMETAG.DLL**
   - **LXTOOLS.DLL**
   - **MPX_MAIN.DLL**
   - **MPX_COUNTRY.DLL**
4. Restart the application (Delph Seismic or DelphMap) and, when prompted, locate the file **SERIALSRV.EXE**.

Message Templates and Options

A number of pre-defined message templates exist for parsing information arriving at a serial port from a particular system/sensor. Those templates are shown in Table 1.

TABLE 1. ***Input Systems and Supported Message Formats***

System	Message Template	Comments
Navigation	• NMEA0183 • NR202K • Nav_Delph • ATS • Posidonia • TrackPoint II	← $GPGGA, $GPGLL, etc. ← Accepts Grid coords ← Launches ATS Server ← Requires Beacon # ← Standard-EC format
Single Beam	• SB_NMEA • SB_Deso • Marimatech_Deso25 • EchoTrac_Deso25 • EchoTrack_DBS • Knudsen_Deso20 • Knudsen_$PKEL • Knudsen_Elac • Raytheon 719 • Fansweep	

TABLE 1. ***Input Systems and Supported Message Formats (cont'd)***

System	Message Template	Comments
Motion Sensor	• NR230 • Seatex • TSS (Tss1) • TSS (Simrad) • TSS ($PRDID) • Octans (Photonetics) • EZ-COMPASS	
Aux. Sensor	• Heading (NMEA) • KVH (HDM Message) • Time (ZDA Message) • Egg 866/876 • OSP • DQI	← Depth sensor
Scanning Sonar	• MS1000	

Upon selecting a message template, additional options associated with that template may be entered in the box below the template field. For example, in the case of the NMEA0183 template type, all commands associated with NMEA strings in Isis are supported in DelphNav. So if the navigation string contains undesirable or redundant NMEA types, you can specify DelphNav to ignore the information through the **NOGLL**, **NOVTG**, **NOHDG**, etc. A complete list of the available options that can be applied to incoming NMEA messages appears in Table 2.

TABLE 2. ***Options applicable to incoming NMEA messages***

Message Description	Template	Options
Navigation	GGA	NOGGA NOCLOCK
Navigation	GLL	NOGLL NOCLOCK
Statistics	GST	
Statistics	GSA	
Heading	HDT	NOHDT
Heading	HDM	
Speed	VTG	NOVTG
Time	ZDA	
NR203 Position	PDAS	
NR230 Attitude	PSER	
NR230 Attitude	A.	
NMEA Depth	DBS	
NMEA Depth	DBT	
NMEA Depth	DPT	
$PKEL Depth	PKEL	
TSS Attitude	PRDID	
OCTAN Attitude	PHTRH	

Making or Using a Survey Plan

A Survey Plan is essentially a set of lines over which the survey will be run. The Survey Planning Editor enables you to do the following tasks:

- Draw lines along which the vessel can be navigated.
- Draw points as individual waypoints towards which the vessel can steer.
- Create an object or lines manually by typing coordinates into a spreadsheet.
- Import objects or lines from an ASCII file.
- Create a channel and associated cross lines at a user-defined interval.
- Edit channel bathymetry or channel profiles along the defined survey lines.

The end result of any Survey Planning session is the creation of a Vector layer in DelphMap. This Vector layer has a generic name of **SurveyPlanning**, which is linked to a **DDS_VOB** file with a default name of *{ProjectName}*_**Planning.DDS_VOB**.

To set up the survey plan in DelphNav

1. If navigation acquisition was turned on, turn it ***off*** by disconnecting the Serial Port Linkup (button must ***not*** be green). Verify the navigation acquisition status in the status bar. It should say, "**Serial input: Off**".
2. If you have not already done so, create a new project (**Project** → **New Project**), then select a location and name for your project.
3. In the upper left corner of the Survey Control Panel, click **Start/Stop Survey Planning Editor**. (icon is shown to the right).

   If you have not yet opened or created a survey plan in DelphNav, a Survey Planning Setup dialog box opens and prompts you to create a new survey plan or open / import an existing one (Figure 6).

   If creating a new survey plan, note that a default name is applied in accordance with the Project name and directory location; this default name cannot be edited at this stage.

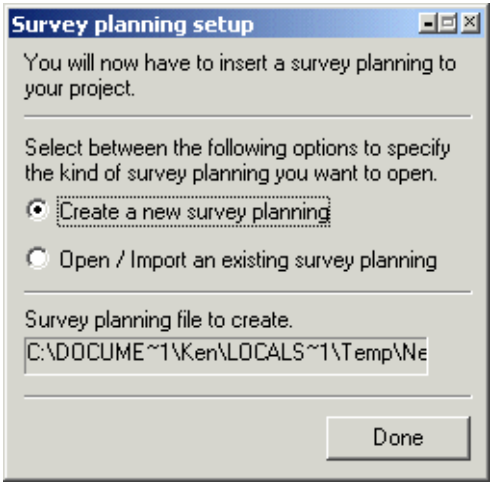

Survey planning setup
You will now have to insert a survey planning to your project.
Select between the following options to specify the kind of survey planning you want to open.
Create a new survey planning
Open / Import an existing survey planning
Survey planning file to create.
C:\DOCUME~1\Ken\LOCALS~1\Temp\Ne
Done

FIGURE 6. ***Survey planning dialog (before a project is opened)***

If no other imagery exists in the DelphMap window, DelphNav prompts you to choose a projection for your project when you click **Done**. These Projection and Datum parameters represent what will be ***displayed*** in DelphMap, and need not be identical to the Projection and Datum of the ***incoming*** navigation. After specifying the Projection and Datum, DelphNav will prompt you for the location of your working area if no external navigation has been received by the program. This information is entered in the form of a NW corner and E-W N-S extents in meters. Note that by right-clicking in the text area of this dialog box the NW corner coordinates can be toggled between geographic and grid coordinates.

If you are opening or importing an existing survey plan, DelphNav prompts you to select a file when you activate the Open/Import an existing survey planning radio button. If a new project was not created, then the new survey plan is stored in the Windows temporary folder (location depends on which Windows operating system you are using). In Windows 2000, for instance, the location is…

`C:\Documents and Settings\USER_NAME\Local Settings\Temp`

…where login account is substituted for **`USER_NAME`**.

Note: To change the folder where your survey planning and other DelphMap / DelphNav-related files are saved, choose **Project** → **Save As...** and choose a folder. This folder then becomes the default folder for the whole project.

Once a proper DelphMap project file has been opened or created, DelphNav displays the Survey Planning Tools dialog box (Figure 7).

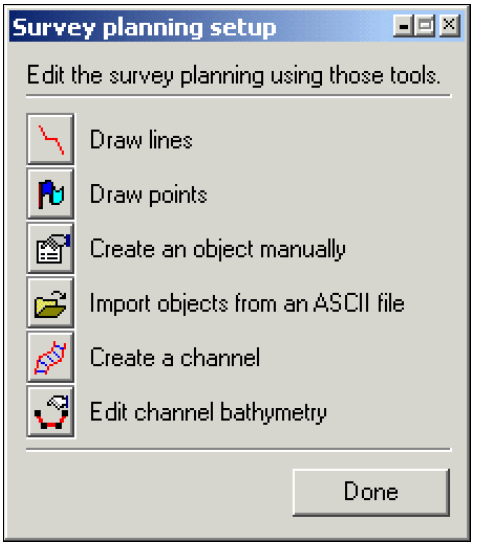


FIGURE 7. ***Survey planning tools dialog box***

Drawing Lines Independently of Each Other

Lines along which to navigate may be entered either through a drawing tool, as coordinates in a spreadsheet, or by importing an ASCII file of coordinates. The first of these methods, **Draw lines**, is explained next.

To draw lines for a survey plan

1. From Survey planning setup click the **Draw lines** button (icon shown to the right), then use the title bar to drag the dialog box to one side. (

2. Use the coordinate display in the Distance Window to position the mouse cursor at the start of the first survey line. Exact points need not be specified at this stage because each coordinate associated with the points constructing the line may be edited upon selecting the **Save** option.
3. Click at the required location, move the mouse cursor to the next point of the line, and click again.
4. Continue in this manner drawing as many series of connected segments (or legs) as you need.
5. When you have finished drawing the various legs of the line, right-click, and a menu of choices is displayed (Figure 8). Choose the **Save** option.

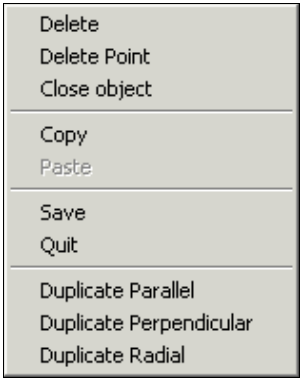


FIGURE 8. ***Menu for acting upon drawn lines***

At this time, you can edit the coordinates of the line. Figure 9 shows the Waypoint/ Profile Editing dialog box associated with the **Save** option. Note that DelphNav supports multiple line segments but not curved lines.

6. When you are satisfied you have correct coordinates click **Save**.

   At this point the line will be added to the list of lines in the Survey Planning box.

7. Click the **+** sign to reveal the SOL EOL coordinates.

   Note that the direction of the line (Start Point and End Point) corresponds to the order in which the line points were entered using the mouse in step 3. Line direction may be reversed at a later time if desired. A "Running Man" icon denotes the SOL and a "Stop Sign" icon denotes the EOL.
8. You may continue adding lines anywhere in the working area. Note that clicking on the line in the list will highlight the line in the main DelphMap window.

Drawing Duplicate Lines

Drawing parallel, perpendicular, or radial lines are options of the dialog shown in Figure 8. Upon selecting one of the Duplicate Line options, DelphNav will prompt you for the number of lines to be drawn port or starboard of the selected line. Port and starboard sides are determined by the direction in which the selected line was drawn. For example, if the line was drawn from north to south, think of a vessel sailing 180º. Consequently, the starboard side would be left of the selected line as displayed in the main DelphMap window.

To add duplicate lines to a survey plan

1. Bring up the Survey Planning setup dialog box, if it is not already displayed, but do not click **Draw lines**. If the button is already depressed, disable the tool by left-clicking on the button.
2. Move the mouse cursor over the line to which you want add parallel lines, and left-click.

   The line color will change to green with small edit boxes at each waypoint.
3. Right-click and choose one of the Duplicate options:
   - **Duplicate Parallel** — generates lines to either side of the line at the "profile spacing." Edit the Profile Spacing and Port/Starboard Profile Number fields if the defaults are unacceptable. If the default line direction is not acceptable (i.e., parallel to the selected line) then this parameter can be modified by the Set Profile Direction option.
   - **Duplicate Perpendicular** — generates "cross lines" with control over length and spacing. For multi-segment lines, perpendicular lines will be added to each segment. The Profile Spacing option is the same for Parallel lines: i.e., the distance

between the drawn perpendicular lines. The Port Length and Starboard Length options are the lengths of the perpendicular line(s) to either side of the selected line (with port and starboard orientation defined by the run direction of the selected line). Note that the first perpendicular line added to the Survey Plan crosses the selected line's start coordinate.

- **Duplicate Radial** — generates radially spaced lines with options for the angle between the lines and the number of lines port or starboard of the selected line's end coordinate.

4. To finish, right-click and select **Quit**.
5. To close the Survey Planning setup, click **Done**.

   DelphNav now prompts you with the question: Do you want to start data acquisition now? The options are:

   - **Check the acquisition parameters** — displays the serial port setup box.
   - **Yes** — takes you into the online mode.
   - **No** — returns you to the standard DelphNav window in offline mode.

   After choosing either the **Yes** or **No** option listed above, the Survey Planning session is complete.
6. Saving your project is recommended at this time.

Drawing Points

Waypoints may be added to a Survey Plain either by saving a Line as a set of points (as opposed to the default of saving as a Profile) or with the Draw Points tool as discussed in this next section.

To draw one or more points

1. In the Survey planning setup dialog box (Figure 7 on page 16), click on the **Draw points** button (icon shown to the right).

2. In an area of interest in your imagery, click to establish a point.

   The system marks the location in your imagery with a small, red box. At the same time, the system displays the Waypoint / Profile Editing dialog box (Figure 9), revealing the point's coordinates in Northings and Eastings. The values may be edited at this stage, with the changes registered through clicking on the **Apply** button.

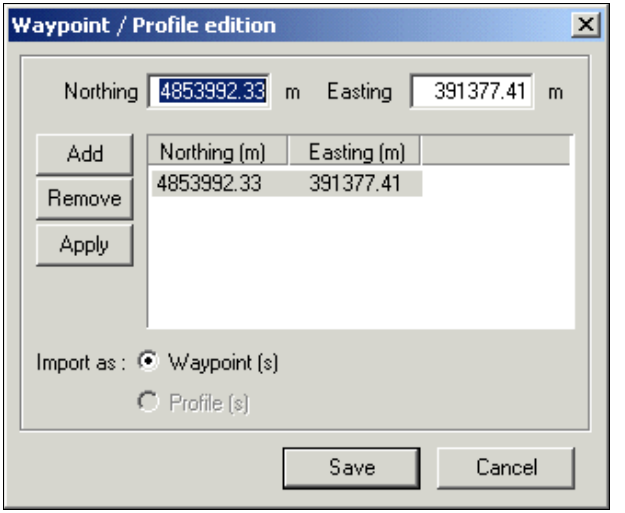


FIGURE 9. ***Typical data for an initial point established in imagery***

3. If you want to include the current point in the imagery, click **Save**. A waypoint is added to the Points listing of the Survey Control Panel window (select the Points tab to view these waypoints).
4. Continue to add pairs of points (Northings and Eastings) for as many points as you wish to appear in your imagery, clicking **Save** as each point is added.

Creating An Object Manually

With this survey planning tool, you can create a series of waypoints or object profiles by specifying Northings and Eastings within the Waypoint/Profile Editing dialog box.

To create an object manually

1. Click the **Create an object manually** button (icon shown to the right).
   The system displays the Waypoint/Profile Editing dialog box (Figure 10, showing sample data).

2. Type in a pair of coordinates in the Northing and Easting fields of this dialog box. Click **Add** to add the pair of Northing and Easting values spreadsheet. To delete a waypoint, select the Northing/Easting couplet from the spreadsheet list and click on **Remove**.
3. Continue to specify new Northings and Eastings and **Add** them to the list until you have as many paired points as you want. If any coordinates need to be modified, highlight the point of interest in the spreadsheet list; the corresponding Northing and Easting values will be shown in the edit fields at the top of the dialog box. Change the coordinate values and then click the **Apply** button; the values associated with that point will change in the spreadsheet list.

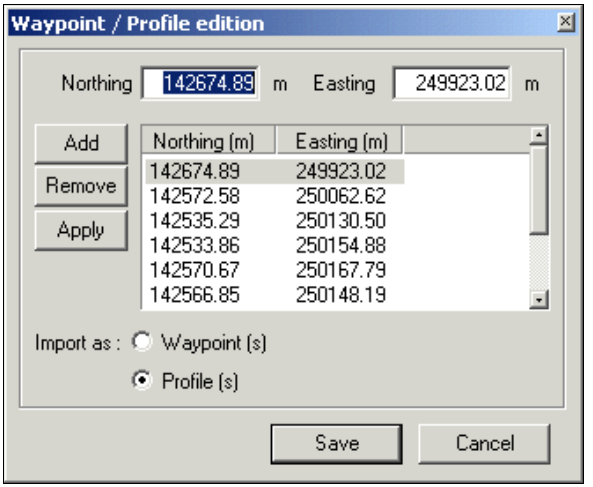


FIGURE 10. ***Waypoint/Profile editing dialog box, with sample data***

4. When your list is complete, choose either the **Waypoint(s)** or **Profile(s)** import option.
5. Click **Save** to close the Waypoint / Profile Editing dialog box and register the Points or Profile in the Survey Control Panel window and in DelphNav.

   If you chose **Waypoint(s)** in the Waypoint / Profile Editing dialog box, the system marks your imagery with crosses at the paired points. These waypoints are shown in the Points window of the Survey Control Panel (select the Points tab).

If you chose **Profile(s)**, the system joins the paired points in your imagery with line segments. The "object" is registered as a line in the Survey Control Panel (select the Lines tab).

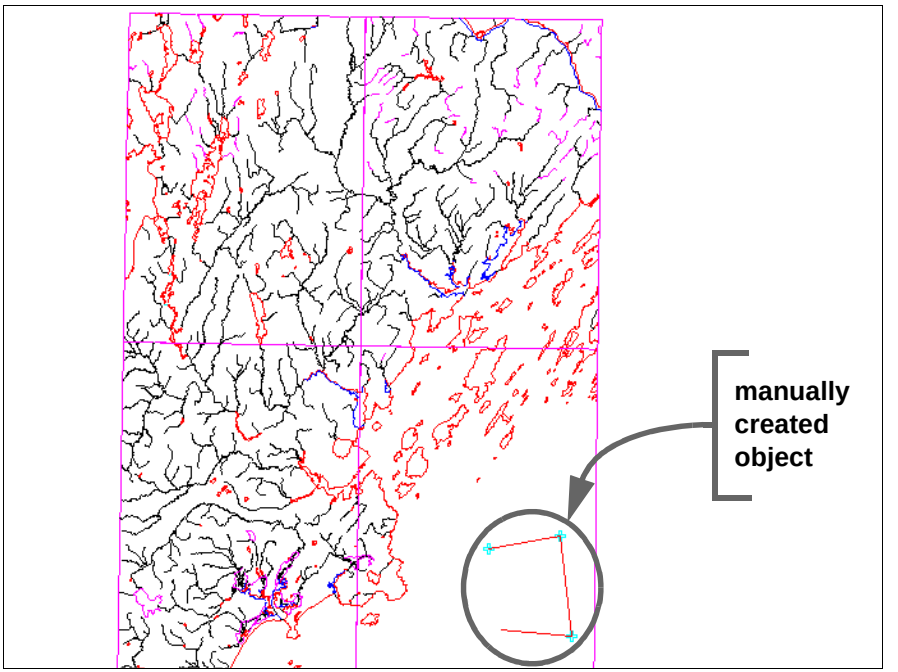


FIGURE 11. ***Example of a manually created object in imagery***

Importing Objects From an ASCII File

In DelphNav you can import a survey plan or set of lines in ASCII format. The file must be structured as follows:

For each survey line you should have at least two paired values: two or more Easting and Northing pairs or two or more Latitude and Longitude pairs. A non-numeric character (usually a space) must separate the paired navigation values.

Any line of text in your ASCII file that contains a non-numeric character is interpreted as a separator of data, not data itself. Separators and data exist on their own lines of text. The separator can be any string of text that's meaningful to you. Separator lines should not be consecutive; real data (one or more pairs of navigation coordinates on one or more lines) must be the next line after a separator line. Data lines, however, can be consecutive and contiguous (e.g, a series of waypoints within a survey line).

All lines must end with a **<CarriageReturn>/<LineFeed>** pair of control characters, in keeping with the DOS and Windows convention.

If there is only one point per object, the object is imported as a waypoint. If there are multiple points in an object, they are merged into a line object (with multiple waypoints).

As an example, importing the ASCII file shown in Figure 12 creates four lines and one stand-alone waypoint. The characters SOL separating each object could be any other non-numeric string. For the purposes of this function, numeric characters are defined to be: **0**, **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **.**, **+**, and **-** .

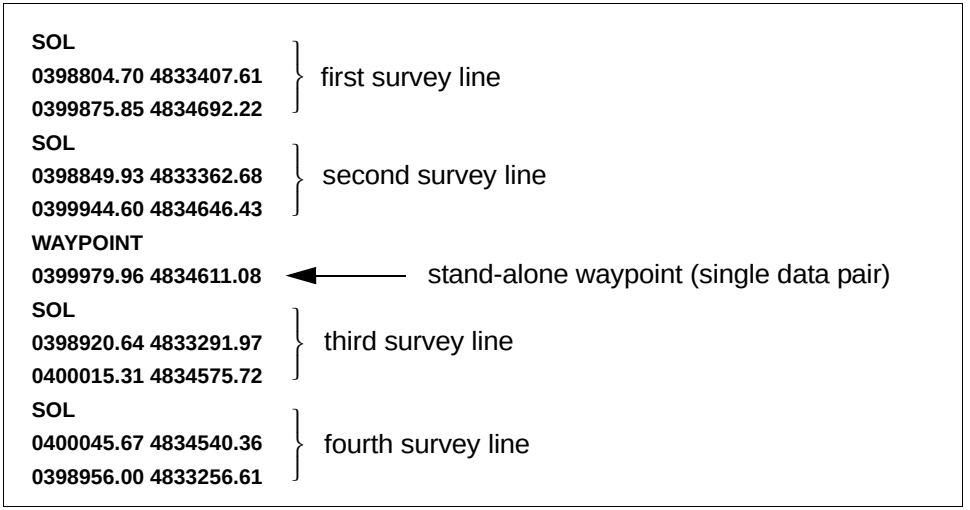


FIGURE 12. ***Sample ASCII data to be imported into DelphNav***

Importing Coordinates in Latitude and Longitude

When importing coordinates in Lat/Long format, the following formats are supported:

- Decimal Degrees, DD.DDDDDD (e.g., 57.234567, 03.005678)
- Degrees Decimal Minutes, DD.MMDDD (e.g., 57.14074, 03.003407)
- Degrees Minutes Seconds, DDMMSS.SS (e.g., 571404.44, 030020.44)

Note: No spaces are allowed. Positive longitudes are east, negative are west. Positive latitudes are north, negative are south.

To import lines or points from an ASCII file into DelphNav

1. Click the **Import objects from an ASCII file** button (icon shown to the right).

   The system displays an Open dialog box.

2. Browse for and select the ASCII text file to be imported; click **Open** to import it.

   The system displays the ASCII importation setup dialog box (Figure 13).

   In the example shown in Figure 13, the ASCII file only has Eastings and Northings, and they are correctly arranged (Eastings first, then Northings) according to the default import option of DelphNav. However, the default Positions, Descriptions, and Units can be modified to accommodate different layouts or units (e.g., Latitude and Longitude in decimal degrees).

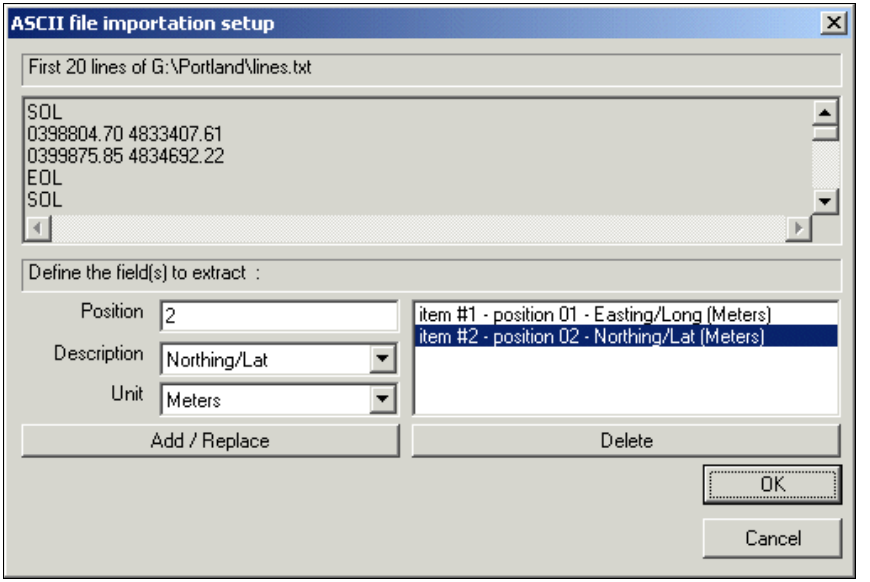


FIGURE 13. ***ASCII file importation setup dialog box***

3. Click **OK**.

The next dialog box to open, the Input Projection Settings, allows you to specify the Projection and Datum of the coordinates to be imported (e.g., UTM, Zone 19, WGS84).

Note that in the example provided in Figure 13, two lines of non-numeric characters occur between lines of waypoint coordinates (EOL and then SOL). Although the lines still import correctly, the following error message will also be generated:

`An error occurred while importing survey planning objects.`

This message can be ignored if all lines are registered properly (check the Line listing in the Survey Control Panel).

4. After specifying the Input Projection Settings, the lines and waypoints should be registered in the Survey Control Panel.

5. If you are finished with planning your survey, click **Done** to close the Survey Planning setup dialog box.

Figure 14 shows the outline of a quay imported from a DXF file with five survey lines; these lines are also listed in the Survey Control Panel window. Clicking the **+** sign reveals the coordinates for each line.

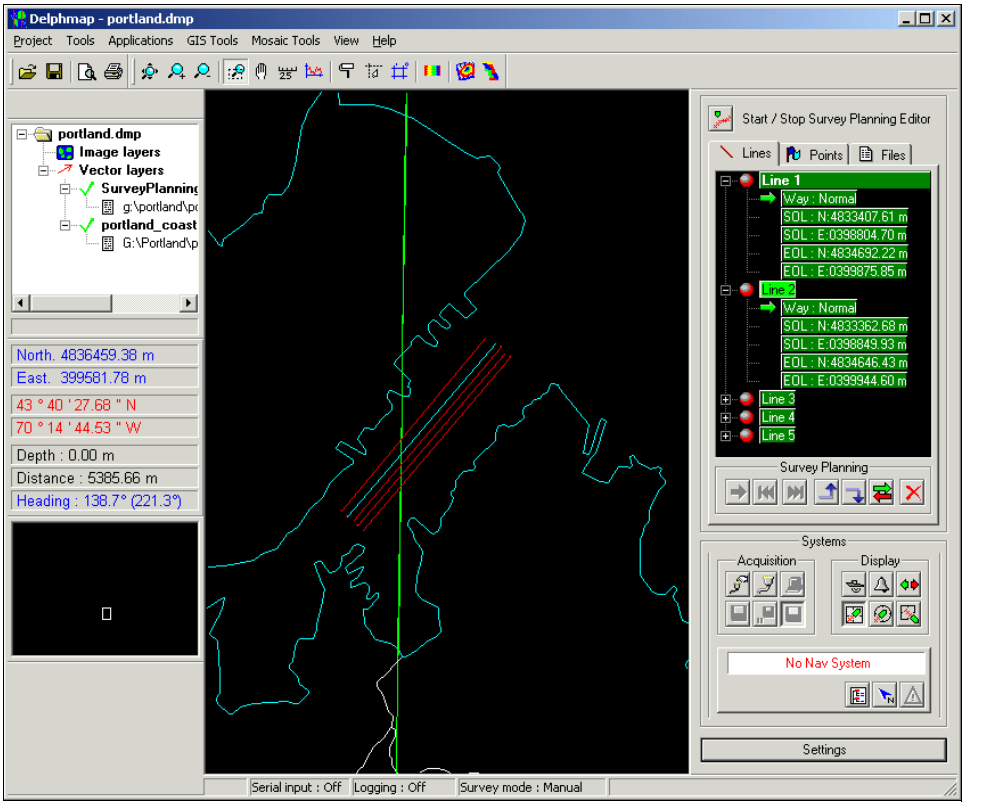


FIGURE 14. ***Five survey lines imported from an ASCII file***

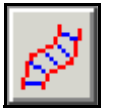
Creating a Channel

The purpose behind creating a channel is to provide a reference surface to which a DTM of the seafloor can be compared. This tool also sets up survey lines along which the vessel can be navigated to acquire profile data across the designed channel.

A channel-design file contains two basic sets of line objects: length-wise borders (one for each “side” of the channel) and a series of transverse lines (cross sections). These line objects may be added to the DelphNav window by drawing them as lines, by inserting coordinates manually in a spreadsheet, or by importing an ASCII file of coordinates. The channel-design tool will lead you through this process as follows:

To create a channel design

1. Click the **Create a channel** button (icon shown to the right).



The system displays the Channel design procedure dialog box (Figure 15), where you can import an existing channel or create a new one. The Channel design procedure dialog box first asks you to **Create border line No 1** (either draw the line, insert manually, or import from an ASCII file). After you create the first border, the system shows **Create border line No 2** in blue text, and **Create border line No 1** displays in black text. Specify the second channel border at this stage.

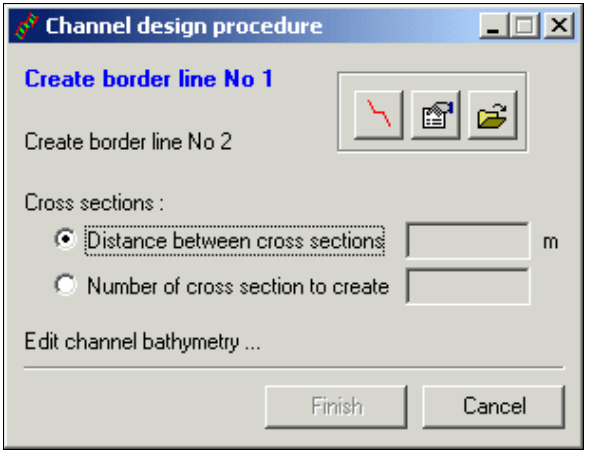


FIGURE 15. ***Channel design procedure dialog box***

2. For the border currently being defined, click one of the three available buttons: **Draw lines** (left icon), **Waypoint profile editor** (middle icon), or the **Open** icon (right icon).
   - If you chose **Draw lines**, you can proceed to draw lines as previously explained in ***'Drawing Lines Independently of Each Other'*** starting on page 16.
   - If you chose **Waypoint profile editor**, you define your channel lines in terms of Northings and Eastings (or latitude and longitude). This procedure is identical to the one explained in ***'Creating An Object Manually'*** starting on page 20.
   - If you chose **Open**, you can import an existing ASCII file containing appropriate coordinate data representing a line (at least two pairs coordinates) that you wish to place in your current imagery. This procedure is identical to importing an ASCII file, explained in ***'Importing Objects From an ASCII File'*** starting on page 22.
3. If this is the first border being defined, repeat step #2 to define the second border.

   If this is the second border being defined, the system makes available the text boxes in the **Cross sections** portion of the dialog box (initially these text boxes were grayed out).

4. In the available text boxes of the dialog box, either specify a value for the **Distance between the cross sections** or the **Number of cross sections to create**; click **Finish**.

The system displays the current state of the channel design (Figure 65) and opens a Channel bathymetry dialog box (Figure 66). You use this dialog box to specify the slope of your channel walls and the depth/slope of the channel as a whole.

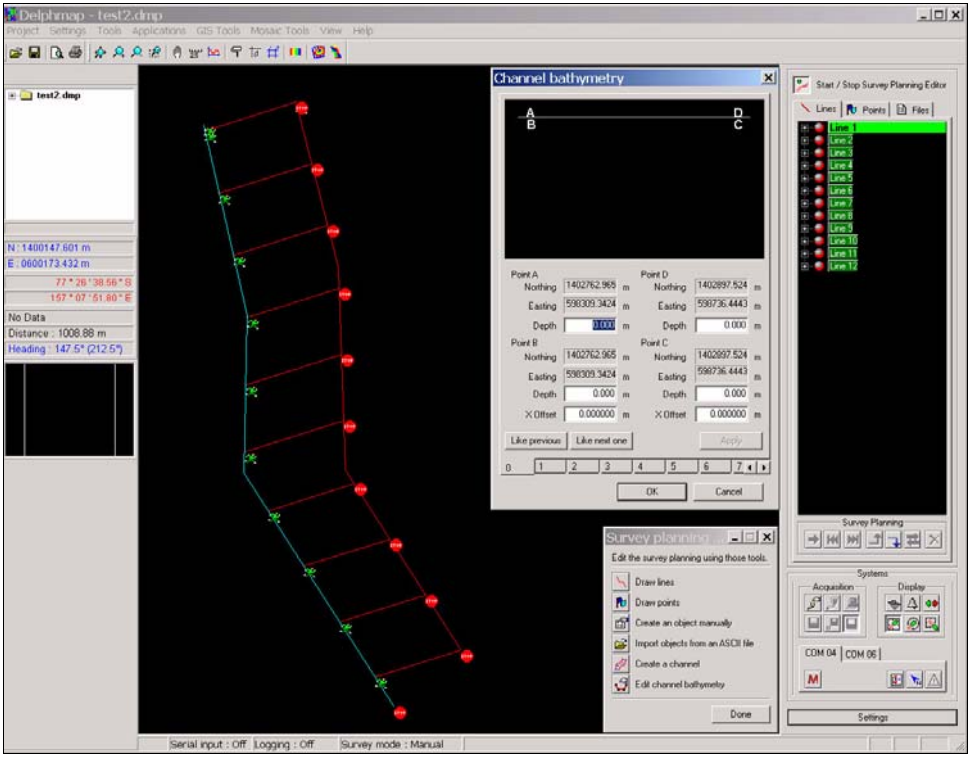


FIGURE 16. ***Channel with borders and cross lines***

The tabs at the bottom of the Channel bathymetry dialog box (Figure 17) correspond to the cross lines of the channel, starting with zero.

Within this window four points define each cross line: two points for the top of the channel at each border intersection (Points A and D), and two points for the bottom of the channel on each side of the wall (Points B and C).

Depth values may be entered for all of these points, thereby setting the depth of the channel surface beneath sea level and the height of the channel walls. The slope of the channel walls is specified by the X-Offset parameters associated with Points C and D.

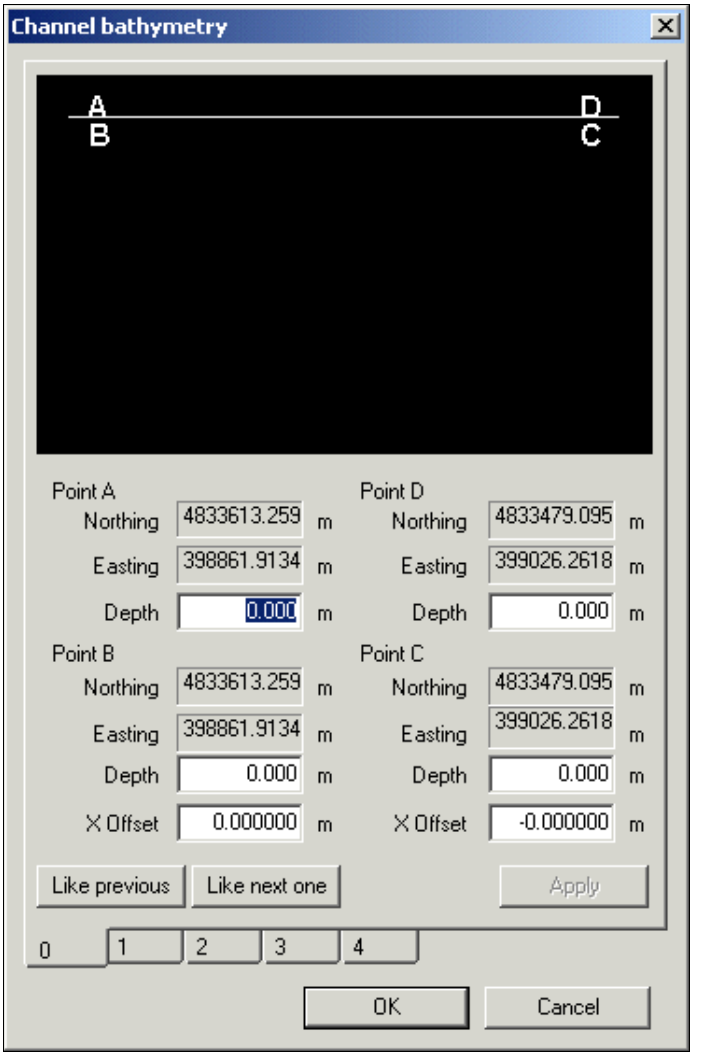


FIGURE 17. ***Cross line profile before channel definition***

5. Progressively modify the Depth and X-Offset parameters associated with each of the cross lines (each of the tab fields) until the channel shape has been adequately defined.
6. Click **OK** when completed.

Note: After defining the profile shape for one cross line, the parameters can be automatically passed to the next profile (or to the previous profile) through selection of the “Like previous” and “Like next one” buttons.

Editing Channel Bathymetry

If an imported or existing channel needs modifications, the Edit Channel Bathymetry tool can be used.

To edit a channel

1. Click the **Edit channel bathymetry** button (icon shown to the right).

When you click the icon, the system opens the Channel bathymetry dialog box like the one shown in Figure 66. The functions available here are the same as those documented in the section called ***‘Creating a Channel’*** starting on page 27.

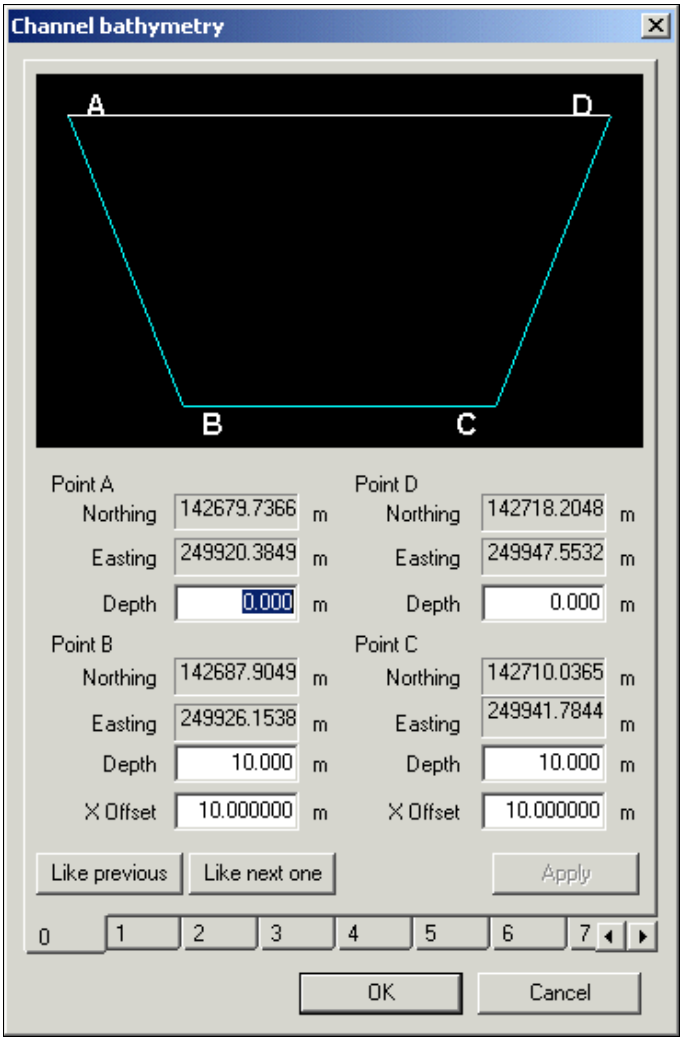


FIGURE 18. ***Cross line profile after channel definition***

Modifying Line Properties

As stated at the beginning of this section, by default the vector layer inserted into DelphNav and related to a survey plan is labeled SurveyPlanning. Properties related to each vector component of the specified survey plan (lines and waypoints) can be modified by right-clicking on the SurveyPlanning layer and selecting Properties.

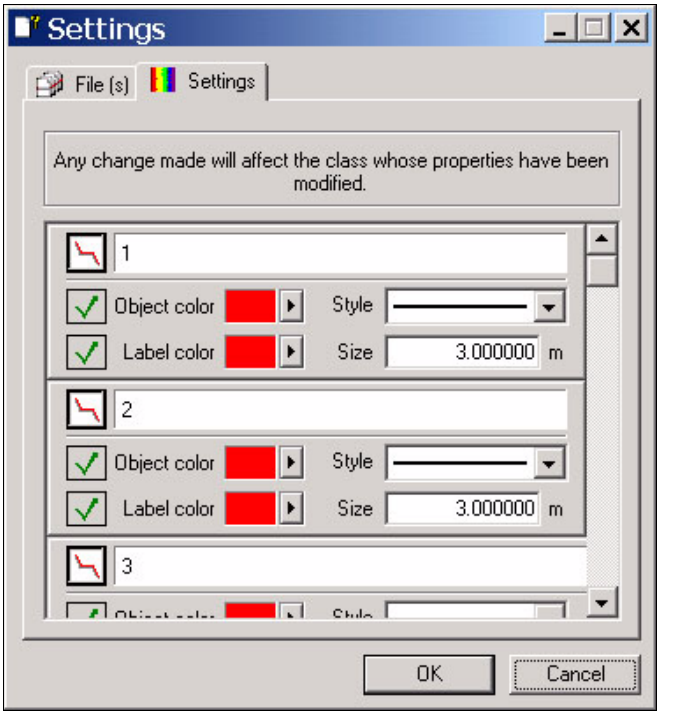


FIGURE 19. ***Settings dialog box associated with Properties option***

The dialog box in Figure 19 opens, and by selecting the Settings tab, various properties associated with each vector object can be modified. For example, increasing the Size parameter from the default of 3.0 m increases the font size of the label attached to that particular line.

Conducting a Survey

Upon completing a survey plan, and assuming all sonar and navigation equipment are working properly, you should now be ready to commence surveying.

The following sections provide information on:

- connecting to serial ports to receive navigation and ancillary information
- various data display windows available when acquiring navigation data
- selection and arranging of lines for navigation using the Survey Control Panel and the helmsman display
- recording of navigation data for later replay or export to another program (for example, Isis or DelphS)

Starting a Survey — Navigation Reception

A basic checklist before the start of any survey is:

1. Have all systems and system options been defined for the serial ports on which information is arriving?
2. Have the serial port parameters been configured properly in Serial Server?
3. Have all relevant serial ports been turned on in Serial Server?
4. Can you view the incoming information strings through the Spy option of Serial Server?
5. Has a survey plan been created in DelphNav?
6. Has all associated background imagery (DXF, SHAPE, or GeoTiff files) been imported to DelphNav?

If all this information is registered in DelphNav, then you should be ready to receive navigation to start the survey.

Establishing navigation reception in DelphNav is relatively straightforward: simply left-click on the Serial Port Linkup button shown in Figure 20. If you haven't imported any background imagery into DelphNav or setup a survey plan, then DelphNav will lead you through a series of dialog boxes to establish a Projection or Datum for the project.

After a short time the Serial Port Linkup button will turn Green and the Serial Setup button will become grayed-out (inactive). At this stage a symbol representing the boat position should appear in the main DelphNav window. The shape of that symbol will depend on the Shape selected during Serial Port Setup.

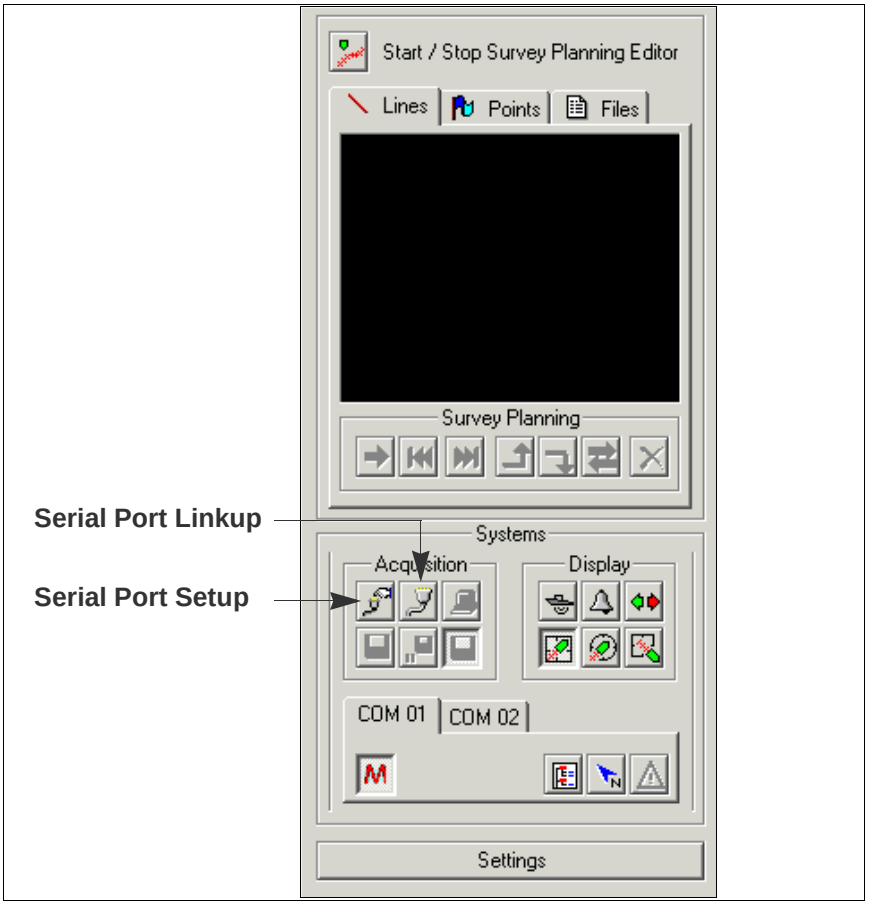


FIGURE 20. ***Starting navigation reception in DelphNav***

Quality Control of a Survey — Data Display Windows

Figure 21 shows the various data display windows offered by DelphNav for providing quality control on incoming data strings and to help position the vessel relative to a selected survey line. Display windows include:

- **Single Beam Profile Display**: capable of displaying both high frequency and low frequency channels of a single beam echo sounder. Audible alarms may be set for an operator-specified depth, with soundings below or above which cause the alarm to trigger.
- **Alarm Display**: a large variety of alarm types may be specified in this window, with both visual and audible notification when operator-specified parameters are exceeded. Parameters related to the GPS, Heading, Attitude, and Single Beam data can be monitored.
- **Helmsman Display**: shows position of vessel relative to the operator-specified survey line. Parameters monitored include distance from SOL/EOL, off-line distance, course to next waypoint, and navigation data recording status.
- **Data Display**: provides a text overview of the incoming data strings. Raw values, statistics, and quality parameters may be viewed for navigation, attitude, and single beam data. X-Y graphs can be generated for any parameter within this window.
- **Compass Display**: shows heading information based on incoming navigation string or other sensor data (for example, True Heading if gyro information received).

Each of these display windows and their associated options will be discussed in detail later in this manual.

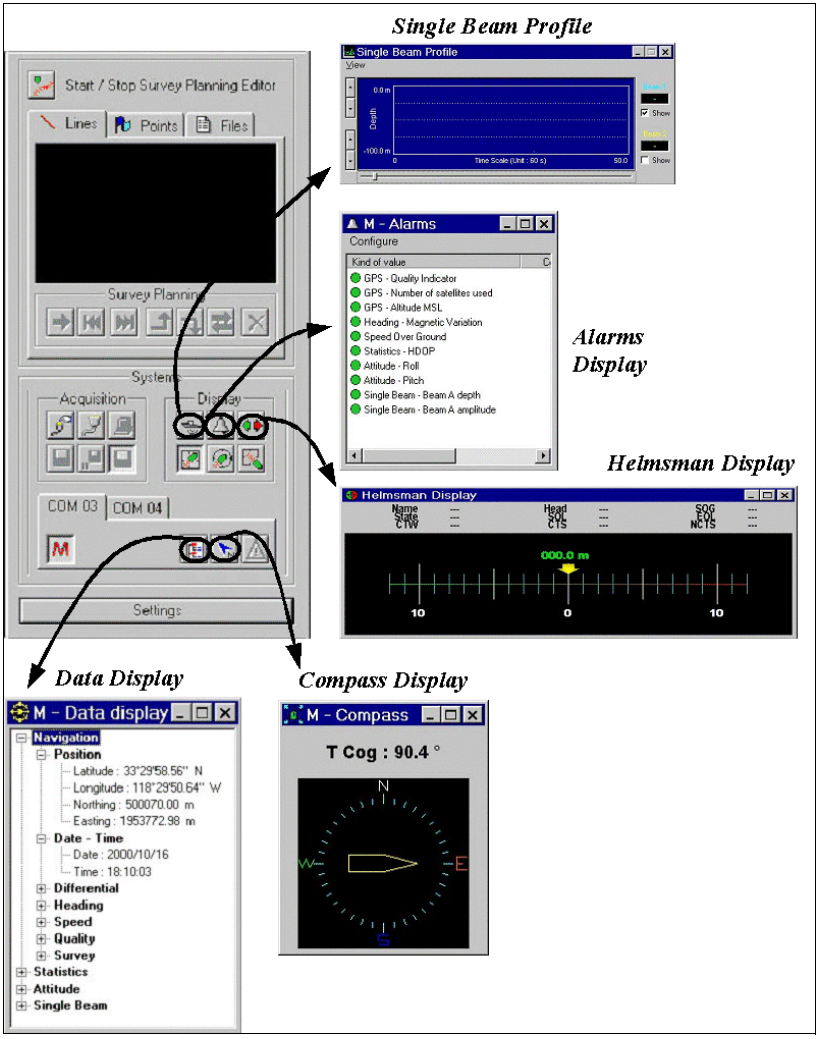


FIGURE 21. ***Data display window options in DelphNav***

Line Selection and Use of the Helmsman Display

When creating a Survey Plan (for example, first creating a line and then creating duplicates of that line), DelphNav adds line names to the Survey Control Panel window (Figure 22). A number of options exist for manipulating these lines, including selecting a line to navigate relative to the Helmsman Display, reordering lines within the list, reversing the run orientation, and deleting lines.

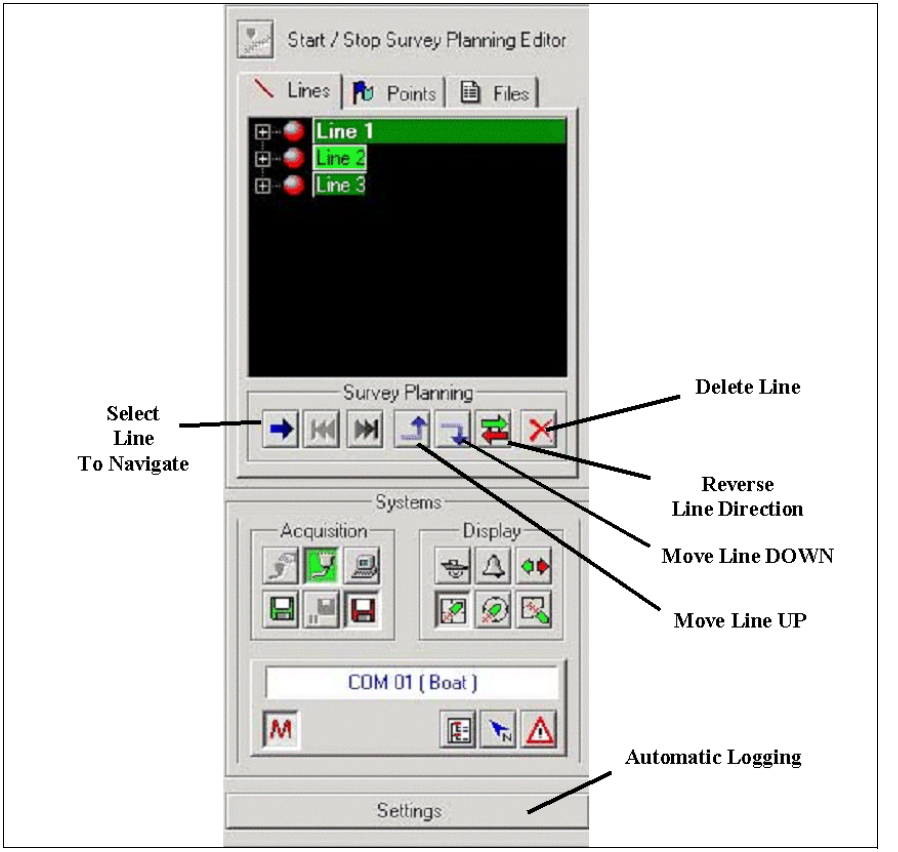


FIGURE 22. ***Line navigation options in DelphNav***

Steering a vessel along a predetermined line is a basic necessity of practically any survey and a core function of any navigation package. In DelphNav, the Helmsman Display window (Figure 23) is a key tool for navigating a vessel along a line. This window provides visual information on vessel distance off the selected survey line, start of line (SOL) EOL distance, and heading direction from waypoint-to-waypoint and vessel-to-waypoint (for correcting off-line deviations).

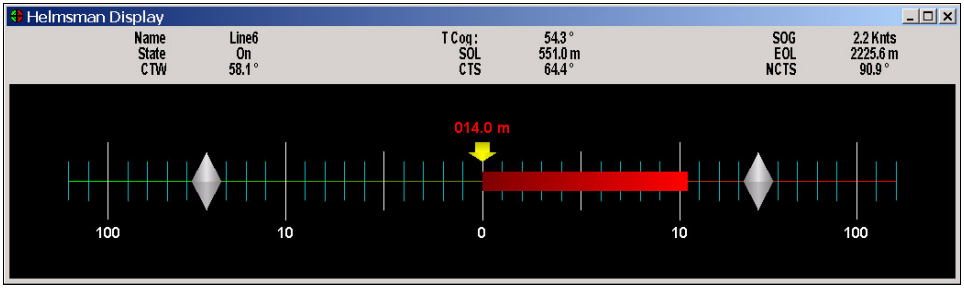


FIGURE 23. ***Helmsman Display***

The first step is to select the line along which you want to steer the vessel. In the Survey Control Panel, an elongated box marks the line that has been selected as the navigation line (Line 1 in Figure 22). If you wish to navigate along another line, simply select the new line either by:

- left-clicking on a line object in the main DelphNav window, or
- left-clicking on a line name in Survey Control Panel.

In either case, the line in the DelphNav window should turn blue, and the corresponding line name should be highlighted.

Next, click on the Select Line button (Figure 22). This will shift the elongated box from the current navigation line to the highlighted line. In addition, the line object in the DelphNav window should turn white. Note that the Select Line button only becomes active if the Serial Linkup button is active (that is, you are receiving navigation data into DelphNav).

In order for the Helmsman display to be correct in terms of off-line magnitude and direction, the lines must be run from SOL to EOL order. A green “running man” icon marks the start of a line (SOL); a “stop sign” icon marks the end of each line (EOL). In order to change any attributes of a line, in particular whether to reverse a line direction, the line of interest must not be declared as the navigation line (that is, the elongated box must not be around the line whose parameters require modification).

To reverse the line direction, select the line of interest and then click on the Reverse Line Direction button in the Survey Control Panel. Note that the “running man” and “stop sign”

icons swap ends within the main DelphNav window. In addition, the box around the line name in the Survey Control Panel changes from “red” to “green” and the text associated with the “Way” field changes from Reverse to Normal.

Line ordering becomes important if the Automatic Logging option is selected. This option is a part of the Settings dialog box, which can be launched from the lowermost button on the Survey Control Panel (Figure 22 on page 40). When this option is activated, the logging of navigation is automated in the sense that recording is turned ON when the vessel is a user-defined distance from the SOL, and turned OFF when the vessel moves an equal distance beyond the EOL. Upon reaching the EOL and the cessation of recording, the next line to navigate is the next line in the list. An additional feature with this option is to PAUSE logging if the vessel exceeds a user-defined off-line distance.

Lines may be reordered using the UP or DOWN buttons in Survey Control Panel (Figure 22 on page 40).

Lines may be removed from the Survey Plan with the Delete button (Figure 22 on page 40).

A number of parameters that can be used as navigation and line steering aids reside in the title bar of the Helmsman Display window. These include:

- **Name** = Name of line being navigated
- **Head** = Heading of the vessel; type of heading selected through Compass window (default is True Course Over Ground) and text changes according to the type selected
- **SOG** = Speed Over Ground
- **State** = Recording state of the navigation (Recording/Pause/Waiting)
- **SOL** = Distance to/from start of line
- **EOL** = Distance to/from end of line
- **CTW** = Course to waypoint, or heading direction from current vessel position to active waypoint (Figure 24)
- **CTS** = Course to steer, or heading direction from previous waypoint to active waypoint (Figure 24)
- **NCTS** = Next course to steer, or heading direction from active waypoint to the next waypoint if survey line consists of more than two waypoints (Figure 24)

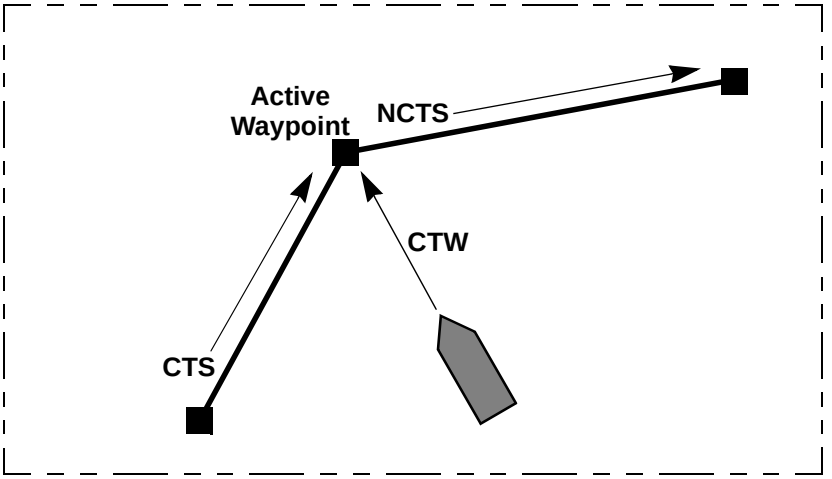


FIGURE 24. ***Course information within Helmsman Display***

Values associated with these parameters can assist in the navigation of the vessel. For example, the CTW parameter indicates the course the helmsman should steer in order to intersect the next waypoint (or end of line segment). The NCTS parameter informs the helmsman of the next heading that must be attained in the case of a multi-segment line.

In addition to these text displays of heading direction, a graphical indication of off-line distance and direction is shown in the main window of the Helmsman Display. In the Figure 23 on page 41 example, the vessel is 13.5 meters to the starboard side of the selected navigation line. The red indicator bar informs the helmsman that the vessel must be turned to port to reduce the off-line distance.

Logging Navigation Data

DelphNav can record incoming navigation data as well as other ancillary information (single-beam data, depth sensor data, motion sensor data, etc.) either in automatic mode or manual mode.

The data are recorded in an XTF file separate from the sonar XTF file. The location of this navigation XTF file is the directory under which the DelphNav project has been saved, or by default in:

`C:\Documents and Settings\`*`USERNAME`***`\Local Settings\Temp`**

(in the case of a New Project). The naming convention for these files is:

ProjectName_LineName_YYMMDD_HHMMSS.XTF
(that is, PortlandProject_L1_001204_092958.XTF)

As mentioned above, two modes exist for data recording: manual or automatic. In manual mode, the operator selects the line to be navigated and then selects the Start Recording button upon approach to the SOL (Figure 25). The vessel track color should change from red to blue.

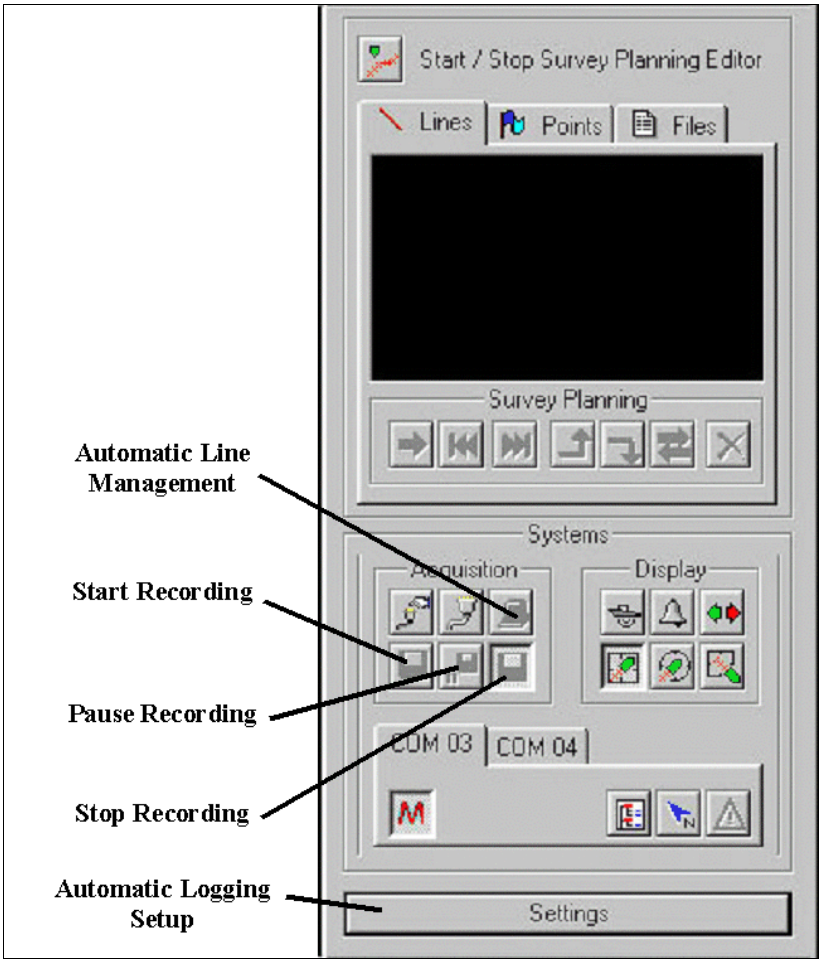


FIGURE 25. ***Navigation Logging Options in Survey Control Panel***

If a single navigation XTF file is desired, then the operator may Pause Recording between lines (Figure 25). If a navigation file per line is desired, then the operator should Stop

Recording at the EOL, and Start Recording at the beginning of the next line (after selecting the new line to navigate on the Survey Planning toolbar).

Automatic recording mode is activated through the Settings button at the bottom of the Survey Control Panel (Figure 25). The Settings dialog box contains parameters to Start/Stop logging a specified distance from the SOL and EOL, and to Pause logging a specified distance off-line. Activation of the Automatic recording mode can either be set within this dialog box (by checking the Automatic procedure option) or by clicking on the Automatic Recording Mode button on the Survey Control Panel (Figure 25).

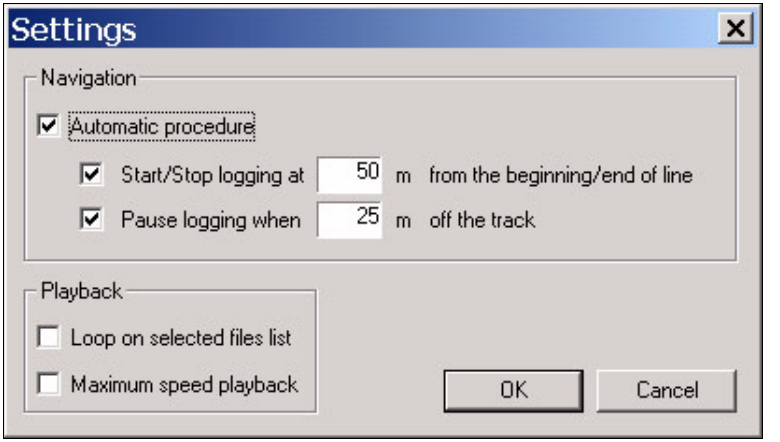


FIGURE 26. ***Settings Options for Automatic Navigation Logging***

As mentioned previously, the line order as shown in the Survey Planning window is important when surveying in Automatic recording mode because DelphNav sequentially selects the next line to navigate based on this list. If a line is missed, or logging is Paused along a line because the vessel wandered too far off-line, simply deactivate Automatic mode, reorder the lines, and reactivate Automatic mode.

Note: The color of the vessel track should indicate the status of recording (red for no recording, blue for recording).

All navigation files may be played back in DelphNav through selecting the Files tab option of the Survey Planning window, opening the relevant XTF files, and selecting the Play button. Options affecting the playback of such files appear in the Settings dialog box shown in Figure 26 on page 46.

Data Display Windows

DelphNav provides a number of display windows for conducting quality control on incoming data strings, in addition to the Helmsman Display window that can be used to assist steering along a survey line. Each of these display windows will be presented in detail in the following sections.

Single Beam Profile Display

The Single Beam Profile Display window (Figure 27) is capable of showing up to two different sources of sounding data (for example, two different frequencies of an echo sounder).

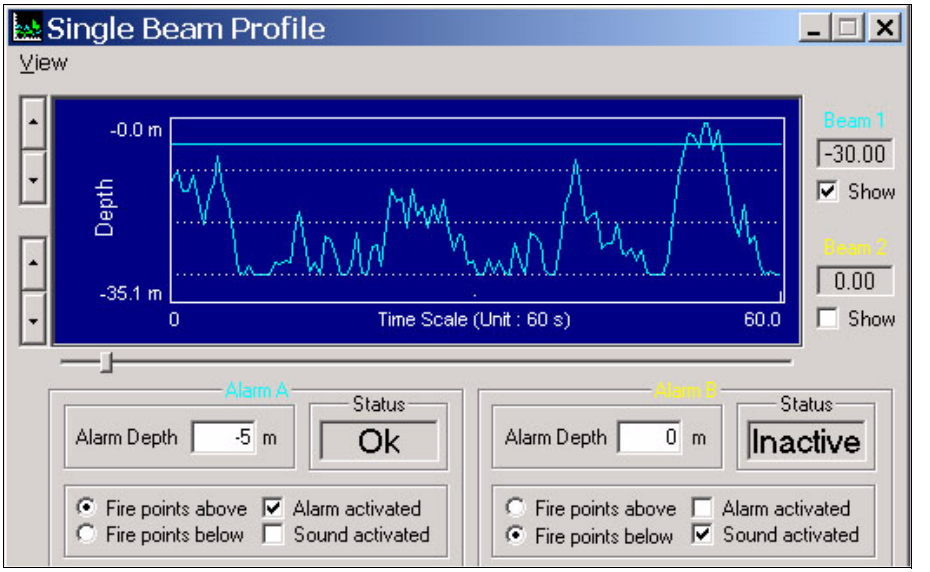


FIGURE 27. ***Single Beam Profile window with alarm***

Minimum and Maximum depths for the Y-axis on the profile display can be set with the up/down buttons on the left side of the window, and the time-scale over which the profile is built (the X-axis) can be adjusted by the slider bar beneath the profile display. The display of either beam can be toggled ON or OFF by the **Show** option on the right side of the window. The current depth being received from the echo sounder is shown in the field beneath the appropriate Beam label.

Two options are available within the View menu of the Single Beam Profile window:

- **Alarm**
- **Alarm Settings**

These options open the panels shown below the main profile window in Figure 27. Parameters that may be specified include:

- Alarm Depth for each echo sounder source (shown as a blue horizontal line in the main profile window)
- Activation/Deactivation of each alarm
- Activation/Deactivation for a sound attached to each alarm
- Alarm triggering when soundings become shallower or deeper than the specified Alarm Depth

Alarm Display

A large variety of alarm types may be specified in this window, with both visual and audible notification when operator-specified parameters are exceeded. Parameters related to the GPS, Heading, Attitude, and Single Beam data can be monitored.

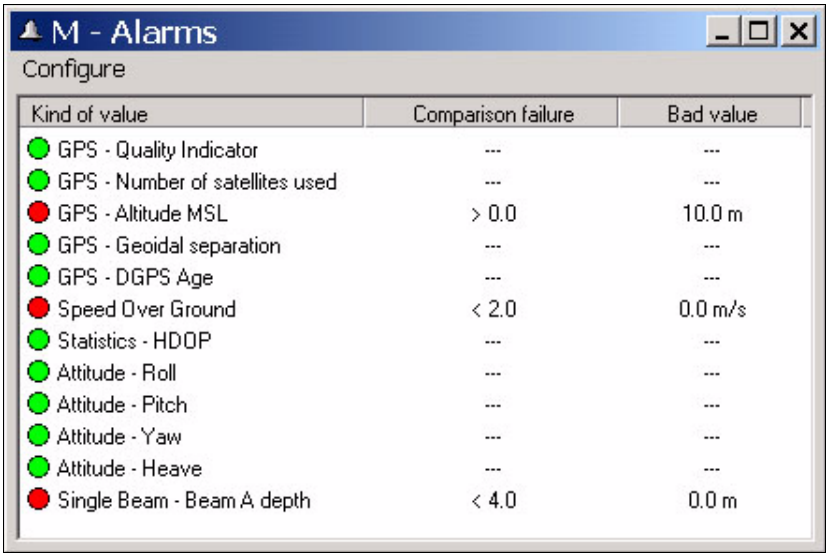


FIGURE 28. ***Alarm display types***

Helmsman Display

This shows position of vessel relative to the operator-specified survey line. Parameters monitored include distance from SOL/EOL, off-line distance, course to next waypoint, and navigation data recording status.

Data Display

This provides a text overview of the incoming data strings. Raw values, statistics, and quality parameters may be viewed for navigation, attitude, and single beam data. X-Y graphs can be generated for any parameter within this window.

Compass Display

This shows heading information based on incoming navigation string or other sensor data (for example, True Heading if gyro information received).

An Example of Survey Planning in DelphNav

The following section shows the progression of a worked example which demonstrates the use of the various survey planning features in DelphNav. By following this example you will learn how to:

- Import a DXF file with coastline (or other) data
- Import an ASCII file containing line (or other) data
- Create a channel
- Edit channel bathymetry

The data in this sample exercise is as follows:

- a DXF coastline file from Portland Maine (**`portland.dxf`**), which has metric coordinate information based on the UTM projection and the NAD27 datum
- a number of lines in an ASCII file based on UTM projection and the WGS1984 datum (**`portland_lines.txt`**), with the coordinates in meters

We will assume that the navigation input will be from a GPS receiver with an output in latitude and longitude using the WGS84 datum. And that the final project requirement is for a UTM projection in meters.

Importing a DXF file with Coastline (or Other) Data

Any information — such as coastlines, pipeline routes, or cable routes that could be represented as line (vector) data — can be imported and displayed in DelphNav as a DXF file.

To import a coastline data (or other data) as a DXF file

Important: DelphNav at this time only imports ASCII DXF files in the AutoCAD R12 format.

1. Click **Project** → **Insert Layers** and use the pull-down arrow to select **ASCII AutoCAD files (*.DXF)**.

   The system displays an Open dialog box (Figure 29).

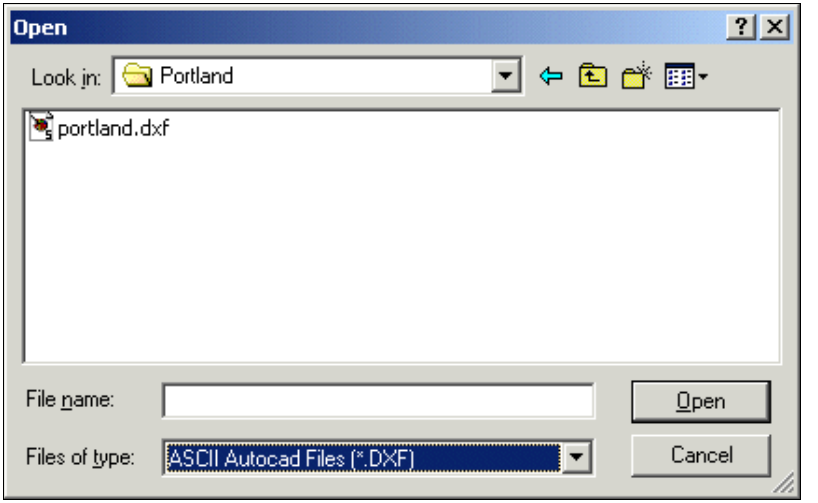


FIGURE 29. ***Open dialog box for importing a DXF file***

2. When you select the file and click **Open**, a message appears (Figure 30):

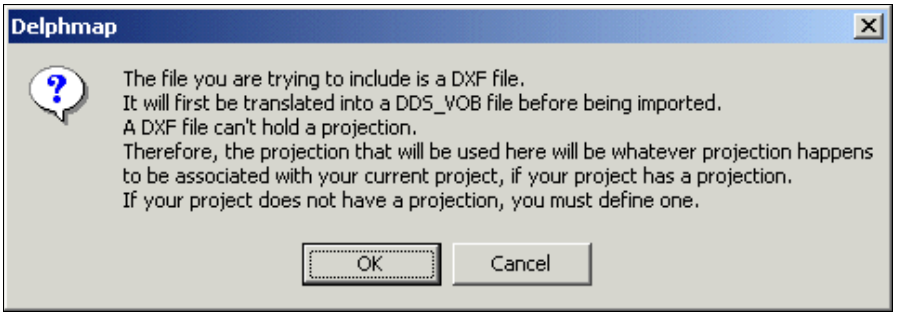

Delphmap
The file you are trying to include is a DXF file.
It will first be translated into a DDS_VOB file before being imported.
A DXF file can't hold a projection.
Therefore, the projection that will be used here will be whatever projection happens to be associated with your current project, if your project has a projection.
If your project does not have a projection, you must define one.
OK
Cancel

FIGURE 30. ***Message before importing a DXF file***

Because DXF files contain no projection information and because we do not yet have a project open, we will need to supply this information.

3. Respond to the message by clicking **OK** in the message box.

   The resulting dialog box asks you for the location where you want to store the imported file. Internally DelphNav converts a DXF file into three files having these extensions:

   DDS_VOB, **DDS_VTX** and **DDS_VLB**

4. Browse to a suitable folder and click **OK**.

The system displays the Projection Settings dialog box shown in Figure 31. You now need to supply DelphNav with appropriate input and output projections for your project.

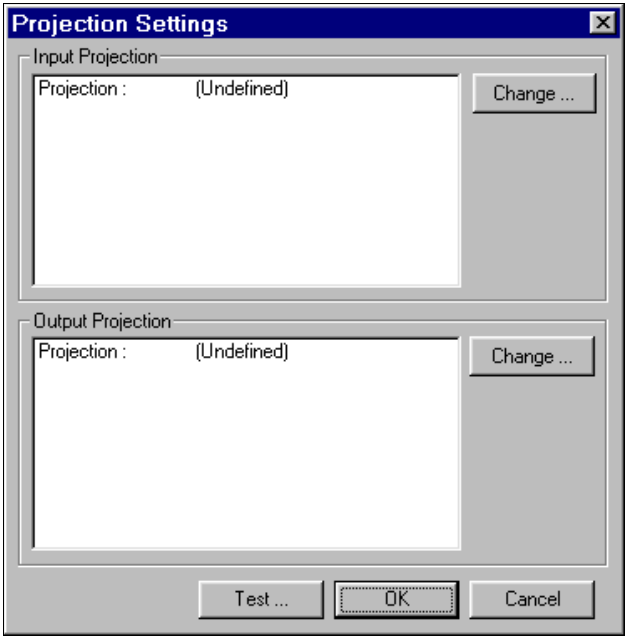


FIGURE 31. ***Projection Settings before specifying projections***

5. In the Projection Settings dialog box, click **Change** next to Input Projection.

6. Because this DXF file in our worked example is the coastline around Portland, Maine, and because the coastline's coordinates are UTM with NAD27 datum, select **Universal Transverse Mercator**; then click **Next**.

   At this point you need some idea of where Portland, Maine, is in terms of its navigation coordinates. It turns out the longitude of Portland, Maine, is around 70 degrees West, and it is in the Northern Hemisphere.

7. Select **Zone 19 (66W to 72W)** and check the **North Hemisphere** radio button; click **Next** and select **North American Datum (1927)**; click **Finish**.

   After a short pause the Projection Settings box re-appears and the system displays the data relevant to your input projection settings (Figure 32).

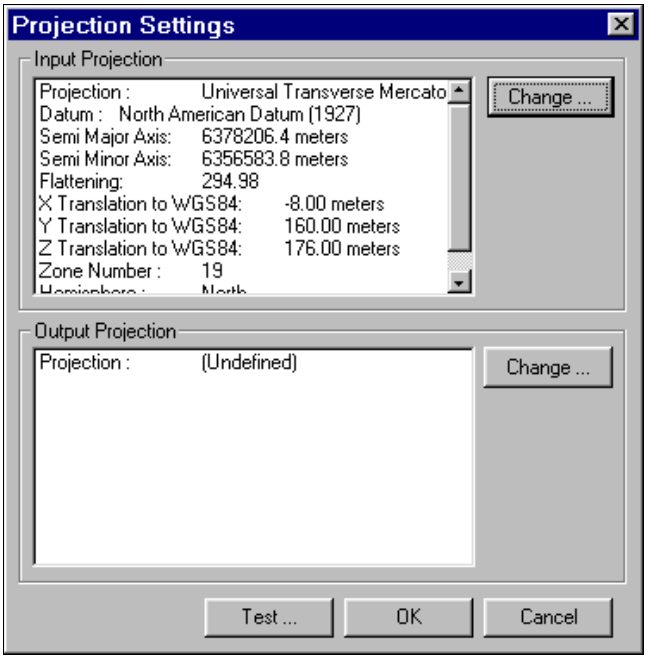


FIGURE 32. ***Projection Settings box with input projection info***

Now we need to setup the output (or working) projection for the project. Recall that we want to use a GPS receiver having a data output in Lat/Long based on WGS84, and that the project is required to be in the UTM projection.

8. In the Projection Settings dialog box, click **Change** next to Output Projection; select **Universal Transverse Mercator** from the list, and click **Next**.
9. Check that the displayed Zone and Hemisphere are correct for Portland, Maine (it should say **Northern hemisphere** and a longitude of approximately 70 degrees west, which corresponds to **Zone 19** in the Select UTM Zone and Hemisphere dialog of the Output Projection settings box);
10. Select **Zone 19** in the dialog box, then click **Next**.

    The system displays the Select Datum dialog of the Output Projection settings box.
11. Select the datum for the output projection: **WGS Datum (1984)**; then click **Finish**.

Note: Observe that we were not obliged to use the North American Datum (1927) as output, even though that datum was used as input. This demonstrates the program's flexibility in allowing the operator to adapt the data to new needs.

After a short pause the Projection Settings box re-appears with the output projection information now added to it. Figure 33 shows the data:

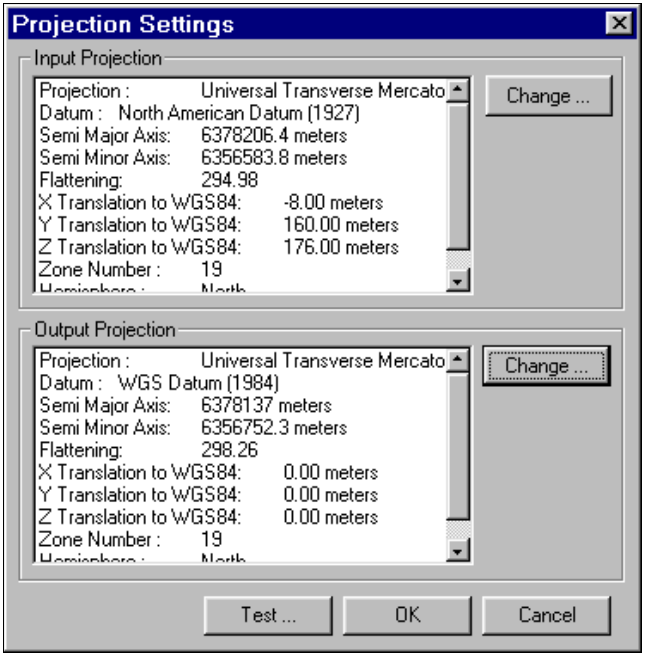

Projection Settings
Input Projection
Projection : Universal Transverse Mercato
Datum : North American Datum (1927)
Semi Major Axis: 6378206.4 meters
Semi Minor Axis: 6356583.8 meters
Flattening: 294.98
X Translation to WGS84: -8.00 meters
Y Translation to WGS84: 160.00 meters
Z Translation to WGS84: 176.00 meters
Zone Number : 19
Change ...
Output Projection
Projection : Universal Transverse Mercato
Datum : WGS Datum (1984)
Semi Major Axis: 6378137 meters
Semi Minor Axis: 6356752.3 meters
Flattening: 298.26
X Translation to WGS84: 0.00 meters
Y Translation to WGS84: 0.00 meters
Z Translation to WGS84: 0.00 meters
Zone Number : 19
Change ...
Test ...
OK
Cancel

FIGURE 33. ***Projection Settings box with output projection info***

12. Click **OK** after checking that everything is correctly entered. If you wish, you can click **Test** to get a dialog box like the one shown in Figure 34.

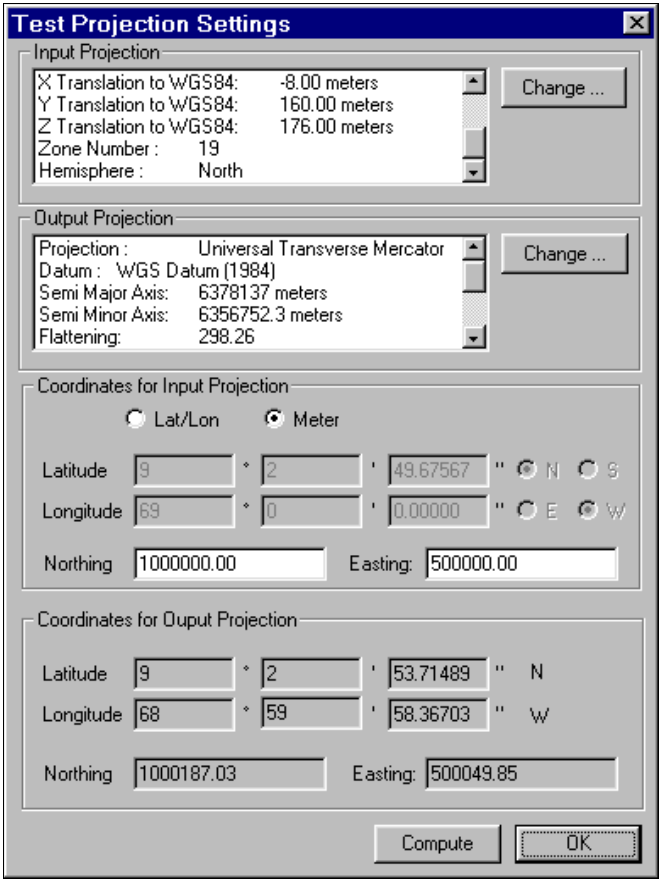


FIGURE 34. ***Test Projection Settings dialog box***

You can use this test feature to check whether the conversion from Lat/Long to grid coordinates in either datum is being carried out correctly, or whether to make “spot” conversions from Lat/Long to grid coordinates. For the former test, of course, you will need to have a test conversion carried out by some independent means for comparison.

13. In the Projection Settings dialog box, click **OK** (either with or without doing **Test**).

After a few seconds of processing, DelphNav converts the DXF file, at which time the following dialog box appears:

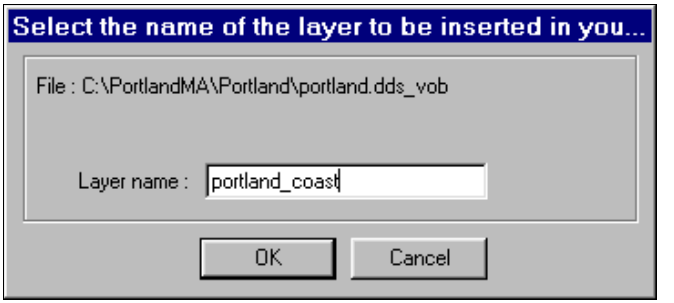


FIGURE 35. ***Layer-insertion dialog box prompting***

By default the layer name will be the same as the DXF file name. In Figure 35 we have changed **`portland`** to **`portland_coast`**. (This refinement of a name change is optional; we chose to give it a new name for added clarity, to make it distinct from the project name.) Note that the data from the DXF file are now referred as a "layer."

14. Click **OK**.

After another brief pause, the imported file should appear. Figure 36 shows the worked example at this stage of processing.

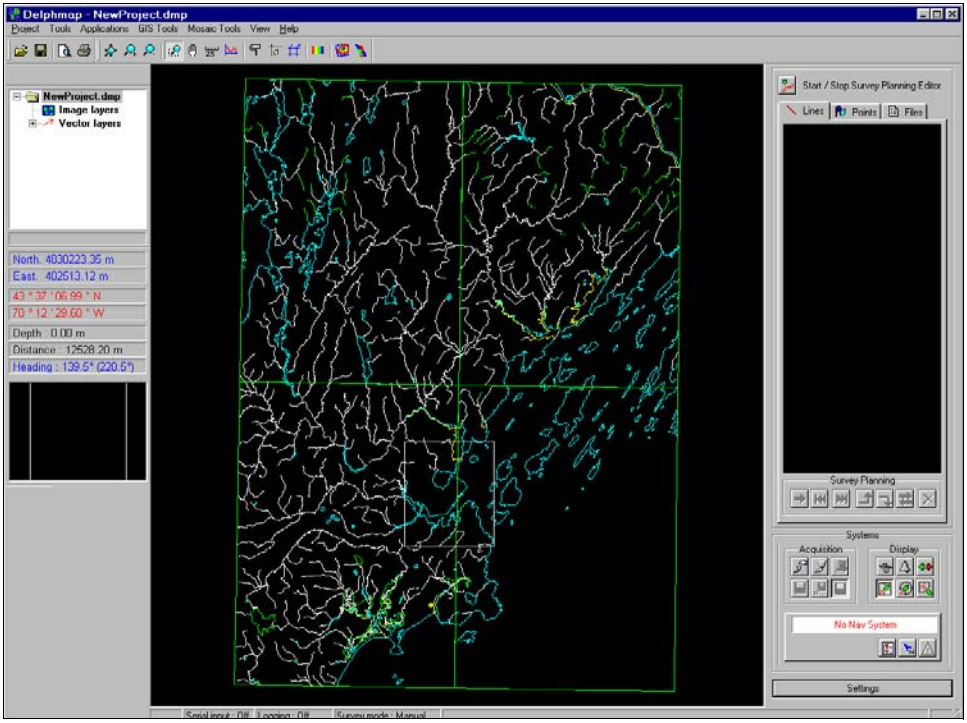


FIGURE 36. ***DXF "layer" imported into DelphNav***

The area we are interested in is the box outlined in white near the center bottom of the image. Figure 37 shows an area that has been enlarged by the zooming technique.

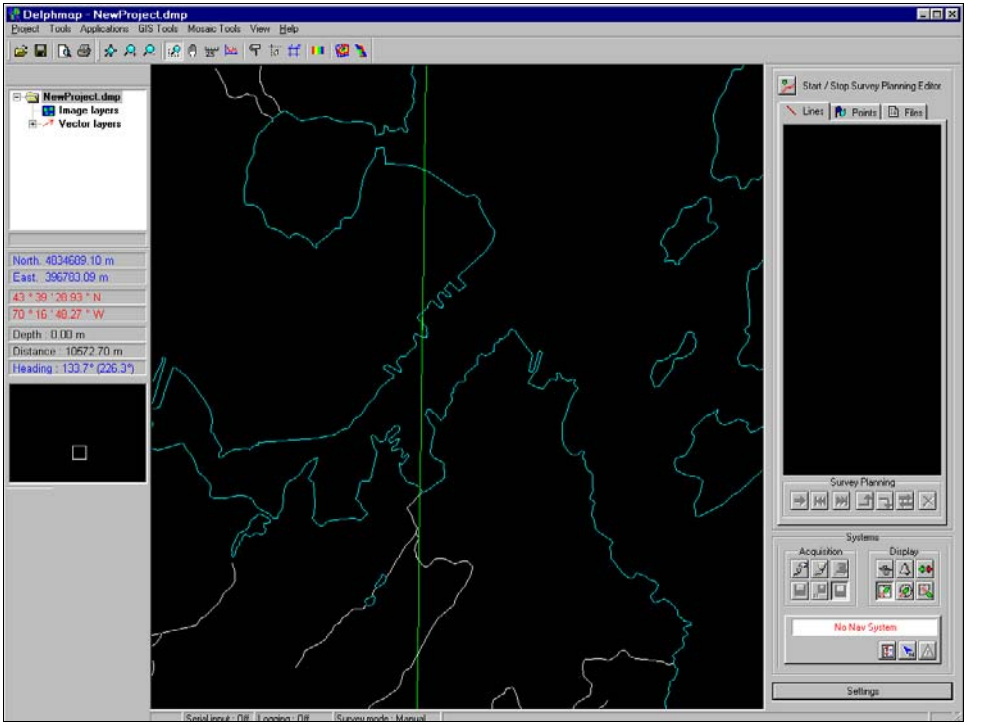


FIGURE 37. ***Zooming in the area of interest***

15. If you wish to change the color of the displayed lines, right-click anywhere on the **portland_coast** layer name (or on the green check mark) and select **properties**.

The system displays the Settings dialog box (Figure 38). Notice that the properties of this layer include the files in the scrollable list.

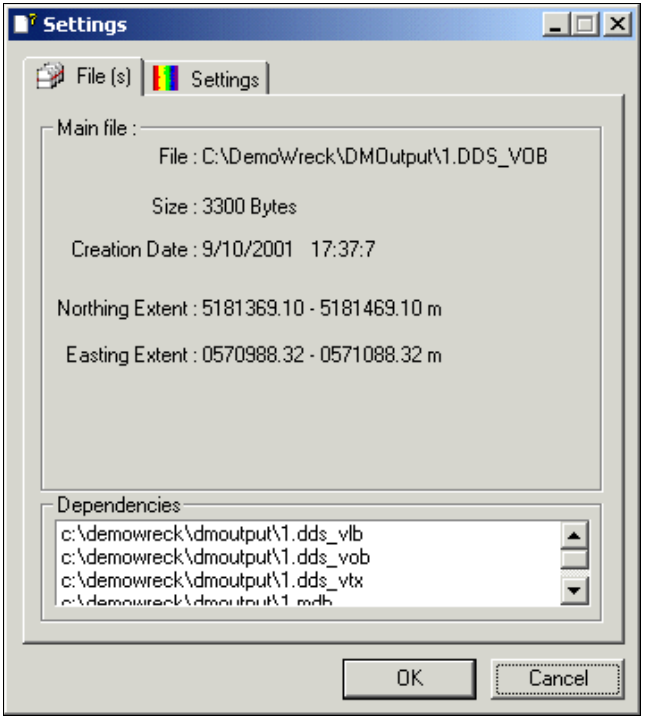


FIGURE 38. ***Files (right-clicking "portland_coast" → "properties")***

16. In the Settings dialog box select the **Settings** tab.

The system displays color controls for managing a layer's colors (Figure 39).

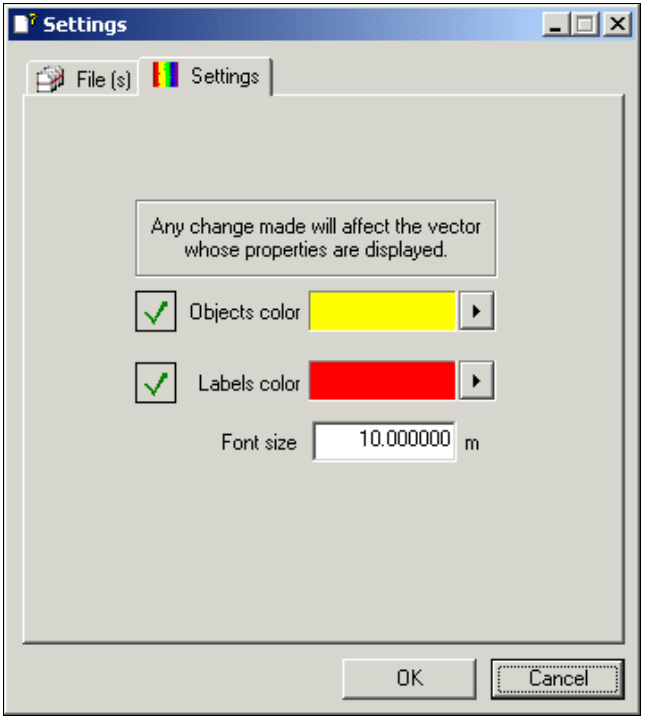


FIGURE 39. ***Settings tab for inspecting or changing a layer's colors***

17. Use the controls in this dialog box to set the color of the lines and the color and size of the labels (if any); click **OK**.

The system closes the Settings dialog box, and the imagery displays in your newly chosen colors. Figure 40 shows an example of this.

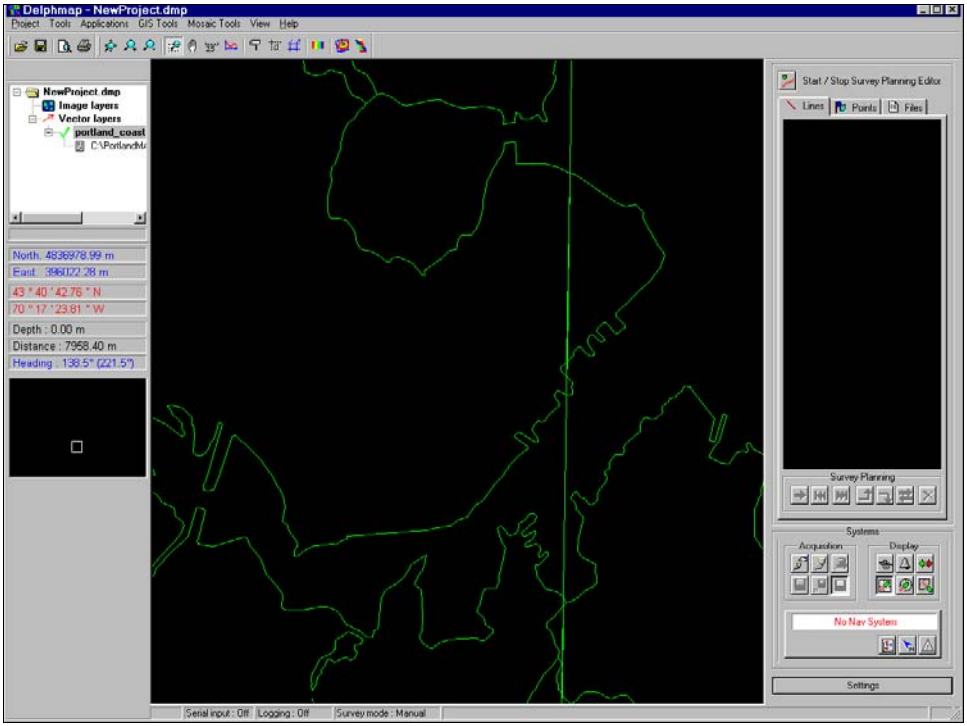


FIGURE 40. ***Imagery displayed in a new color***

18. At this point it is a good idea to save your project: Click **Project** → **Save** (or click the **Save** icon on the taskbar).

This will not only create a **`DMP`** (DelphMap Project) file containing all the references to the various files that you have created, but saving the project also establishes the default directory for creating subsequent layers and converted files.

Note: DMP files do ***not*** contain the actual data files, just the links to the files used to display your imagery. Consequently, if you move this project from its present location/folder you will need to re-import the various files again, thereby updating the project's links to the files.

This completes the importation of the DXF coastline file.

Importing an ASCII Line File

This series of tasks implements the general principles documented in ***'Importing Objects From an ASCII File'*** starting on page 22.

To import an ASCII line file

1. Open the project DMP file.

Assume in this case you have a project called portland.dmp, and it is located in **`g:\Portland`**. In our example, the previously converted coastline around Portland, Maine, is displayed. The line file we are going import is called **`LINES.TXT`**. The format of this file is as follows:

```
ELEMENT 1
xxxxxxx.xxE xxxxxxxx.xxN
xxxxxxx.xxE xxxxxxxx.xxN
```

`ELEMENT 1` is a separator of data. In this case, the two lines that follow are represent the start and end coordinates of a single line, respectively. To indicate a new survey line, you would create another separator on its own line of text before introducing the actual data, like this:

```
ELEMENT 2
xxxxxxx.xxE xxxxxxxx.xxN
xxxxxxx.xxE xxxxxxxx.xxN
```

You would repeat this format for each line in your survey.

A complete ASCII file might look like the data depicted in Figure 41.

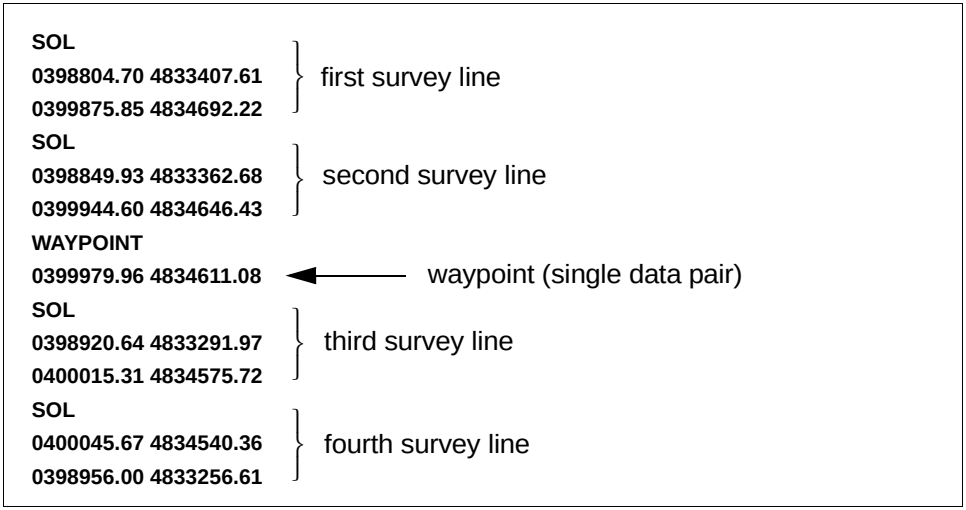


FIGURE 41. ***An example of importable ASCII data***

The import routine considers a non-numeric character to be a separator, so any non-numeric character can be used to separate both the pairs of eastings and northings and also the pairs of coordinates denoting the start and end of a survey line. In this example, a space delimits each easting and northing pair, and the strings **ELEMENT n** separate the survey line data pairs.

2. Click the **Start/Stop Survey Planning Editor** icon.

In the Survey Control Panel, the Survey planning setup dialog box opens (Figure 42).

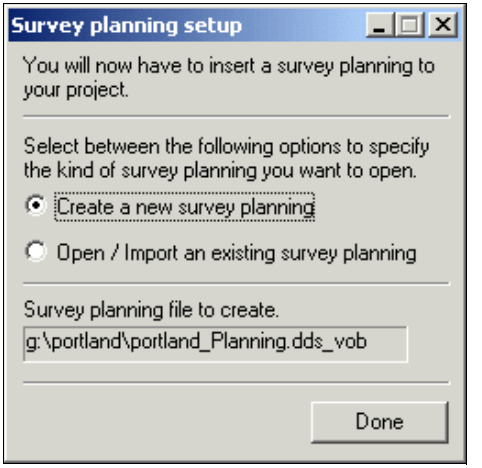

Survey planning setup
You will now have to insert a survey planning to your project.
Select between the following options to specify the kind of survey planning you want to open.
Create a new survey planning
Open / Import an existing survey planning
Survey planning file to create.
g:\portland\portland_Planning.dds_vob
Done

FIGURE 42. ***Survey planning dialog prompting for insertion***

Note that by default you are opening a new survey planning file, and that the name of the file selected for you in this case is called:

`g:\portland\portland_Planning.dds_vob`.

The survey planning file is created in the same folder where the project file (**`portland.dmp`**) is stored.

3. Click **Done**.

   As mentioned in the preliminary information appearing in ***'Making or Using a Survey Plan'*** on page 14, if you are creating a new survey plan, DelphNav prompts you to choose a projection for your project when you click **Done.** If you are opening or importing an existing survey plan, DelphNav prompts you to select a file when you enable the **Open/Import an existing survey planning** radio button.

4. From the next dialog click on **Import objects from an ASCII file** and select the TXT file containing the line data.

Creating a Channel

The steps that are needed to create a channel are:

1. Generate two lines defining the edges or border of the channel.
2. Generate the transverse lines defining the channel cross section.

To create a channel before a survey plan has been made

1. Click these icons in sequence:
   - **Start/Stop Survey Planning Editor** →
   - **Create a new survey planning** →
   - **Done** →
   - **Create channel**.

   The system displays two dialog boxes open: the Survey Planning Setup (Figure 43, left side) and the Channel design procedure (Figure 43, right side).

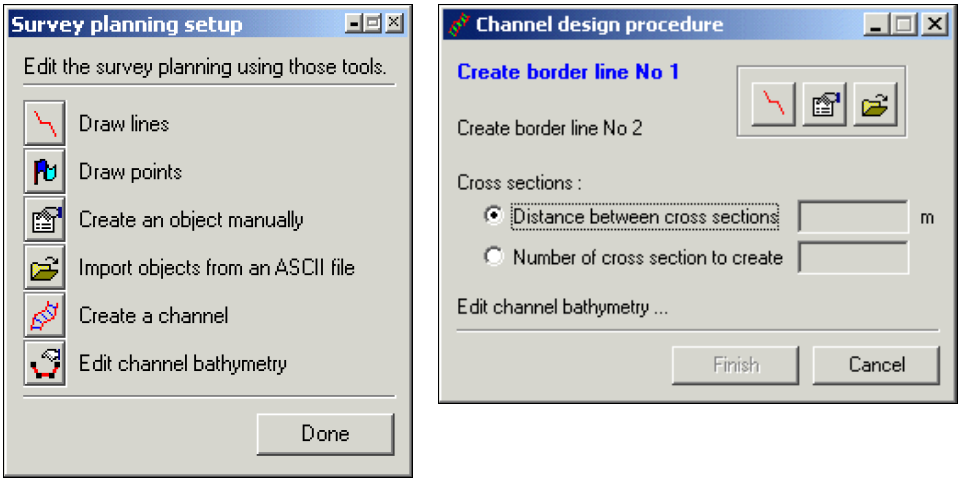
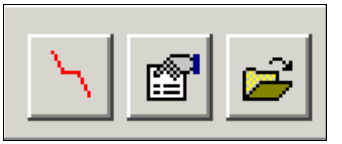


FIGURE 43. ***Survey planning setup with channel design dialog***

2. Do one of the following:



- Click **Draw Lines** (left icon) if you want to graphically enter the line from the DelphNav window.
- Click **Edit channe**l (middle icon) if you want to enter the co-ordinates manually.
- Click **Open file** (right icon) if you have the coordinates in an ASCII file.

The following description is for the graphical (draw lines) method.

To graphically enter the line from the DelphNav window

1. After clicking the **Draw Lines** icon, click at the position on the chart where you want the first border line to start, then click the position where you want the first border line to end. You may click intermediate points if you wish.

2. When you have clicked your last point, right-click with the mouse and select **Save**.

The system displays the Waypoint/Profile editor dialog box.

3. In the Waypoint/Profile Editor dialog box you can edit the coordinates of your line if you wish; then click **Save**.

In the Channel design procedure dialog box, the focus changes to **Create border line No. 2**.

4. Repeat steps #**1**–#**3** to create the second border line.

At this time the **Distance between cross sections** and **Number of cross sections to create** become available in the Channel design procedure dialog box (Figure 44, overlaid on DelphMap's main application window).

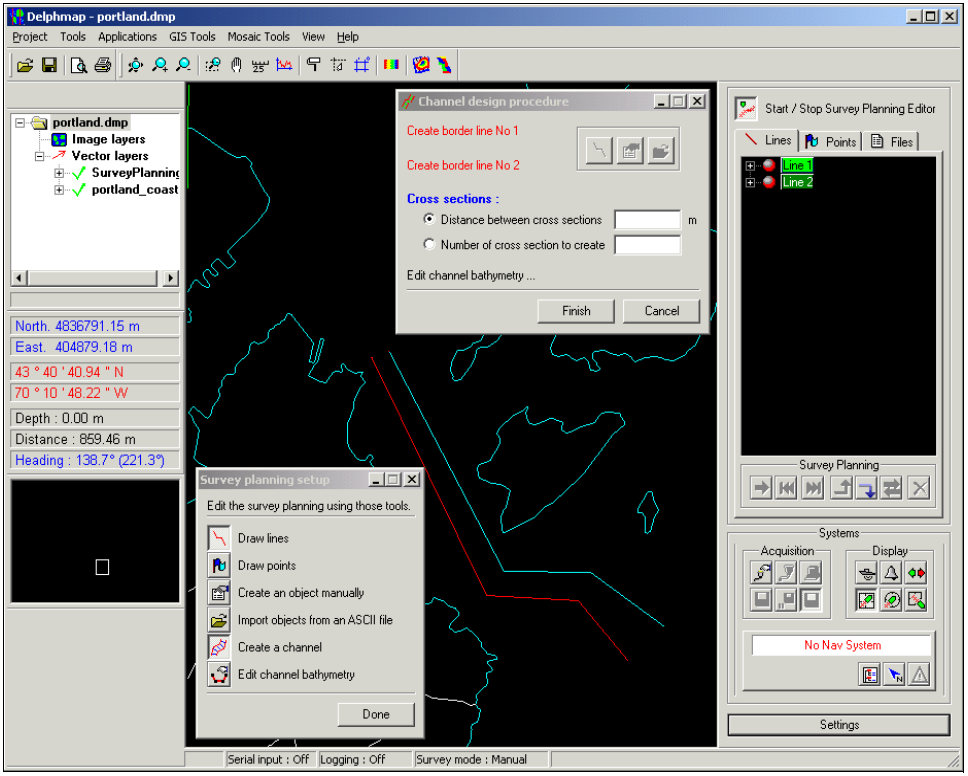


FIGURE 44. ***Channel being defined (with two dialog boxes overlaid)***

5. Enter some appropriate values for the number of cross sections and distance between cross sections and click **Finish**.

At this time the cross sections are drawn on the chart and then the Channel Bathymetry dialog box opens. The first cross section is identified by a tab numbered **0**.

6. Use the numbered tabs at the lower edge of the dialog box to select the section you wish to work on; then enter the values in the offset and depth boxes. Figure 18 on page 33 shows a graphical cross section of such a line so defined.

7. You can now use the numbered tabs at the bottom of the dialog box to move to the next cross section, where you can either enter new channel data or use the **Like previous** or **Like next one** buttons.
8. After entering the last cross section click **OK** to dismiss the dialog box.

   This completes the channel creation routine. (Also see ***'To create a channel design suitable for export to Bathy Pro™'*** if you intend to go on to import that channel design data into Bathy Pro™.)

To later edit a channel cross section, click the **Edit channel bathymetry** icon to display and edit already existing channel cross sections. Through such editing, any of the values in the boxes may be adjusted, including start and end coordinates.

Computing a Volume Difference Using a Channel Design

One of the most useful applications of a channel design file is to use it for computing volumetric differences between data captured during your multibeam survey and your channel design. The volumetric differences pinpoint areas that have not been dredged to your desired depth of the designed channel. You can then use this information to dredge the area of interest so that your dredging conforms to your channel design.

To arrive at that result you work with DelphNav and Bathy Pro™, by turns. In four steps, here's an overview of that process:

1. In DelphNav, create a channel design file (**CHN**) file and rename it with a **TXT** file extension.
2. In Bathy Pro, import the channel design **TXT** file, select any processing options appropriate for it, and have Bathy Pro process it.
3. In DelphNav, import the **DDS_VIF** file created in Bathy Pro.
4. In DelphNav, compute a volumetric delta based on the channel design file and your multibeam survey.

This section explains those tasks in detail.

To create a channel design suitable for export to Bathy Pro™

1. In DelphNav, do one of the following:
   - Perform the procedure ***'Creating a Channel'*** starting on page 27 or

- Perform the procedure ***'Creating a Channel'*** starting on page 67.

2. In either of those referenced procedures, recall that the last step in creating the channel design in DelphNav's Channel bathymetry dialog box is to click the **OK** button.

   When you click **OK**, the system automatically creates an ASCII file containing the channel design data. By default, the location of that file is the same as the location of the Survey Planning Editor. In Windows 2000 that location is…

   `C:\Documents and Settings\USERNAME\Local Settings\Temp`

   …where *`USERNAME`* represents the name of an actual user. That location contains a file having all the X, Y, and Z values associated with the designed channel. Initially this file is named:

   `NewProject_Planning_Channel_1.chn`

3. Having created the channel design file, exit DelphNav.
4. Go to the above-mentioned folder and rename the file by changing its file extension from **`CHN`** to **`TXT`**. (You can also rename the primary part of the file from **`NewProject_Planning_Channel_1`** to a name that reflects the nature of your work. You may also want to move the file to a more convenient working directory for additional work.)

To import the channel design TXT file into Bathy Pro™

1. Run Bathy Pro and right-click on the **Project files** folder.
2. Choose the **Add XYZ ASCII file (Single Beam Data)** option and specify the channel design **`TXT`** file name.
3. While specifying the channel design file name, verify the following parameters for the file:
   - that input and output projections match the survey area, and
   - that the grid resolution is comparable to what will be specified for the multibeam survey.
4. Choose **Bathy Processing** → **Process** to process your data.

   When you choose **Process**, the system automatically creates a **`DDS_VIF`** raster file with the same primary name as the **`TXT`** file you imported.
5. Having created the **`DDS_VIF`** file, exit Bathy Pro.

To import the DDS_VIF file into DelphNav

1. Run DelphMap again, choose **Project** → **Insert Layers**, locate the **`DDS_VIF`** file of interest, and open the **`DDS_VIF`** file to import it.

   By default the color table applied to this file will be gray-scale, but a more advantageous palette may be specified from **GIS Tools** → **Color Palettes**. The resulting dialog box offers data type options for sidescan sonar, bathymetry, and other data types.
2. From **GIS Tools** → **Color Palettes** select the **Bathymetry** data type and use the **Jet** palette. Also see ***'Change the Color Palette Settings'*** on page 28 of the *Using DelphMap* technical manual for more information on color manipulation.

To compute a volumetric delta of channel 'actual' v. design

- For the procedure, see ***'Computing Volumetric Differences'*** starting on page 114 of the *Using DelphMap* technical manual.

Primary and secondary surfaces are selected from existing **`DDS_VIF`** files, with the output being a user-defined volume layer. For example, the primary surface could be the channel design raster layer and the secondary surface could be the processed multibeam data of the seabed.

Accompanying this operation is an ASCII report having the suffix **`LOG`**, listing the volume and surface area above and below the primary image.

Special Navigation Interfaces

DelphMap can work with a number of special navigation interfaces.

ATS Server

The *ATS (**A**utomatic **T**racking **S**tation) Server* converts raw position information from the Geodimeter (horizontal angle, vertical angle, and slope distance) to geographic positions according to user-defined geodetic parameters. These converted positions are forwarded to DelphNav for display of vessel position relative to survey lines or other physical features imported in the form of a **`DXF`** file.

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